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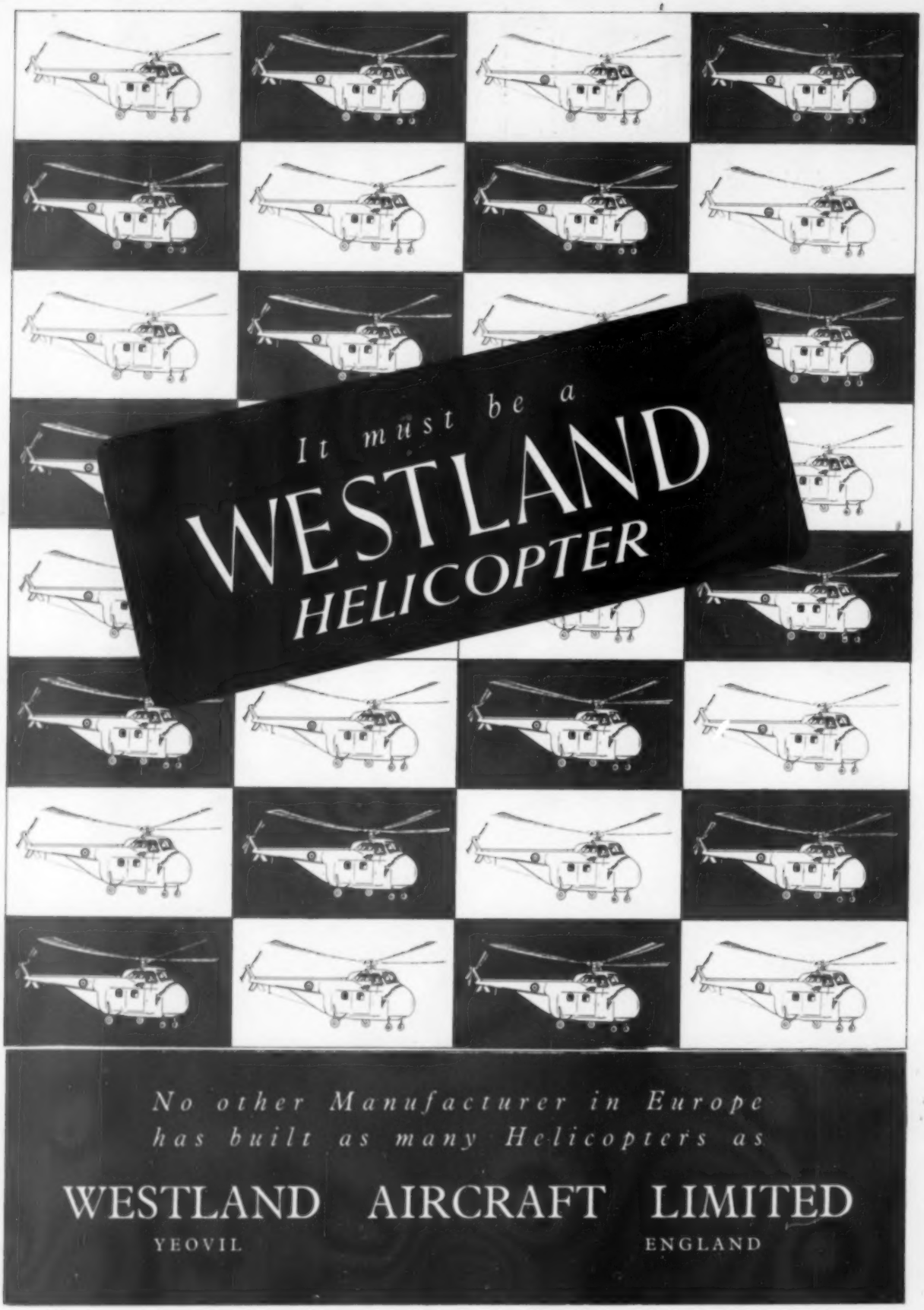

No other Manufacturer in Europe has built as many Helicopters as

WESTLAND AIRCRAFT LIMITED

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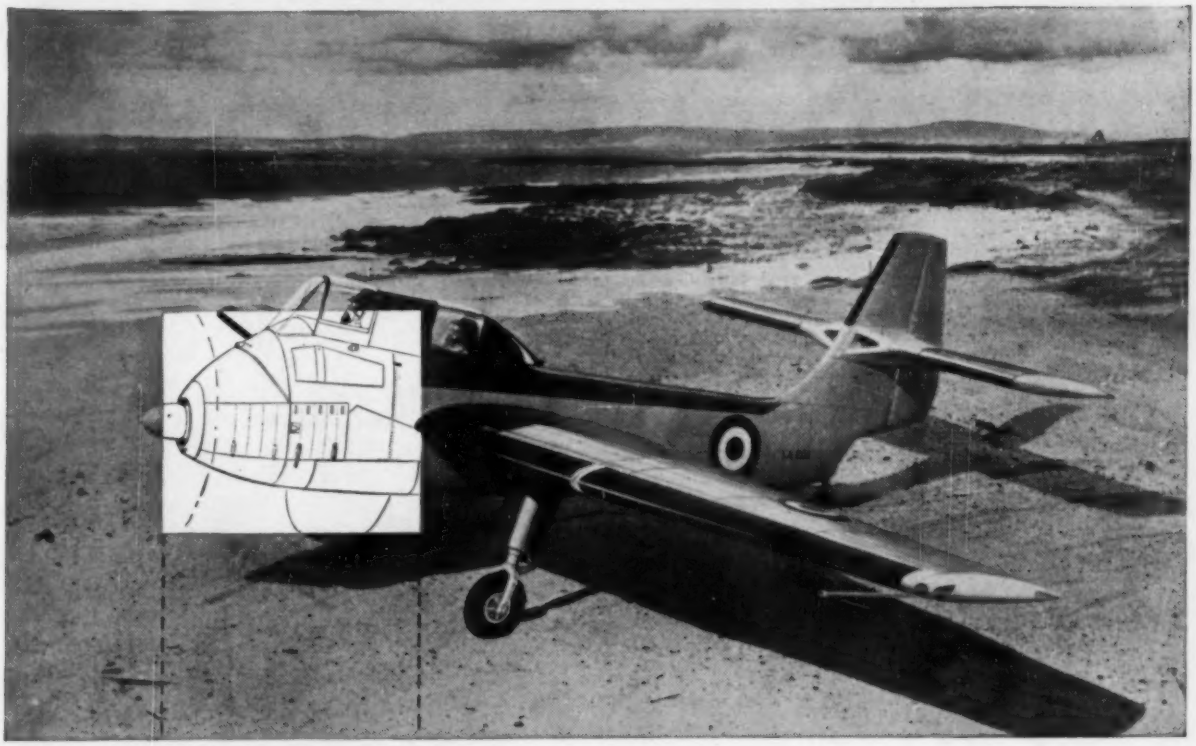
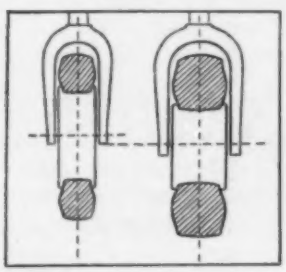
Sand strip – *Seamew* base

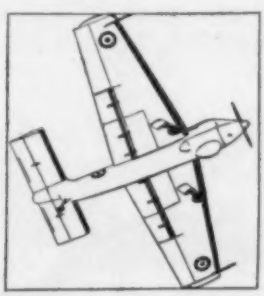


Simplicity of design ensures simplicity of maintenance—and economy in initial cost and in use of spares and manpower. Removable panels make components easily accessible.



The wheels of the Seamew can be swiftly changed, with differing sizes of tyre to suit the surfaces from which it operates.

Seamew—a tough, economical, all-weather submarine hunter. Airborne in a short distance from any rapidly constructed airstrip—or even a stretch of beach—the Seamew can conduct a maritime search with up-to-date radar equipment and use a variety of weapons to effect a kill. Its high manoeuvrability, low stalling speed and fixed shock-absorbing undercarriage enable the Seamew to land back safely after operating in weather conditions impossible for other anti-submarine aircraft.



The *Short* answer is the *Seamew*

Generous flap surfaces contribute to the very low stalling and landing speeds. The Seamew requires the minimum length of runway on emergency airstrip or escort carrier deck.

IN QUANTITY PRODUCTION FOR THE ROYAL NAVY

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United Airgram

UNITED AIRCRAFT EXPORT CORPORATION

J-57-POWERED NAVY F4D FIGHTER EXCEEDS SPEED OF SOUND

The first production model of the Douglas F4D "Skyray" jet fighter, with one Pratt & Whitney Aircraft J-57 turbojet engine and afterburner, exceeded the speed of sound in level flight June 5, 1954. Using the afterburner on take-off, the new U.S. Navy fighter was airborne in 1000 feet, and reached a speed of 450 miles per hour as it climbed past the edge of the airport at Los Angeles, California. Douglas' test pilot said the take-off was "something like being shot out of a cannon".

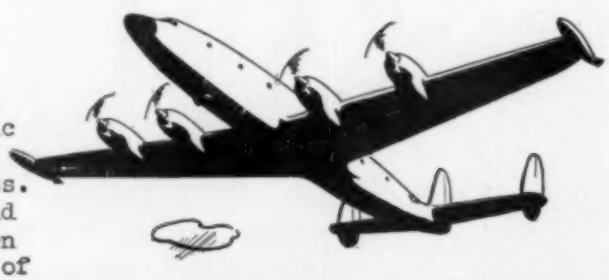
The production "Skyray" promises to be far more potent than the earlier F4D prototype, which in October last year, set a briefly-held world speed record of 753 m.p.h. The production airplanes' more powerful engine, the J-57, produces about 10,000-pound thrust, and considerably more with its afterburner in operation.

Designed as a carrier-based U.S. Navy interceptor, the F4D passed full carrier qualifications in September, 1953, and is now in quantity production at Douglas Aircraft Company's El Segundo division. The supersonic jet is expected to be in shipboard operation next year.

Two other fighter-type aircraft which use the Pratt & Whitney Aircraft J-57 turbojet and afterburner are also in production. They are North American's U.S. Air Force F-100, which holds the world speed record, and the U.S. Air Force F-102, built by Convair.

TURBO-HYDROMATIC PROPELLERS NOW IN PRODUCTION

Hamilton Standard is now producing huge, three-bladed Turbo-Hydromatic propellers for use on turboprop-powered military versions of Lockheed Aircraft Corporation's four-engined "Constellation" transport. The aircraft is being built for both the U.S. Air Force and the U.S. Navy.



Designed as the A3470 model propeller, the new Hamilton Standard Turbo-Hydromatic was developed for use on propeller turbine engines in the 6,000-horsepower class. Behind it lie thousands of hours of ground and flight testing, much of which has been done with a turboprop engine in the nose of a converted B-17 "Flying Fortress" bomber.

The Turbo-Hydromatic is capable of extremely rapid pitch change, to match the sensitivity of the turbine engine. It features special controls for ground handling, its own oil supply, and many other advances in design which assure safety and reliability. It is the result of more than 12 years of continuous research and development in the turboprop field.

Commercial versions, and other models for higher speeds and engine powers are being developed in Hamilton Standard's extensive research facilities in Connecticut.

CHANCE VOUGHT AIRCRAFT NOW AN INDEPENDENT COMPANY

After many years as a manufacturing division of United Aircraft Corporation, Chance Vought Aircraft, Incorporated, became a completely separate business organization on July 1, 1954 with no corporate affiliations with United Aircraft Corporation.

The separation was decided upon last year. On January 1, Chance Vought was incorporated, and became a wholly-owned subsidiary pending completion of separation plans. The move will make it possible for Chance Vought to operate more freely and more effectively in America's competitive airframe industry.

Chance Vought is one of the oldest aircraft companies in the world. It was founded in 1917 by Chance Milton Vought, an aviation pioneer who learned to fly as a student of the Wright brothers.

Charles J. McCarthy has been elected Chairman of the Board of Directors of the new corporation, and has resigned as Vice President of United Aircraft Corporation to assume his new duties. Mr. McCarthy had been General Manager of Chance Vought during the early years of World War II. He is widely known for his long career in aviation, and for his work with the Institute of the Aeronautical Sciences, of which he was president in 1953. He will make his headquarters at Dallas, Texas, where the Chance Vought Cutlass fighter and Regulus guided missile are in production for the U.S. Navy.

SIKORSKY ROLLS OUT NEW ANTI-SUBMARINE HELICOPTER

Early in June, Sikorsky Aircraft rolled out its new XHSS-1 helicopter, a Navy aircraft designed especially for anti-submarine use. This new helicopter, like other Sikorsky types, has a single main rotor and tail rotor. The four main rotor blades and tail rotor assembly both fold for ease of handling and stowage aboard ship.

The XHSS-1 has one large 1420 h.p. aircooled engine mounted in the nose behind clam-shell doors. It has tricycle landing gear, and features a Sikorsky-developed automatic pilot, one of the first such instruments developed for helicopters.

The new helicopter is considerably larger than the familiar S-55 commercial type. It offers increased performance in range, speed, and load-carrying ability. A commercial version of the new Sikorsky, called the S-58, is not yet in production.

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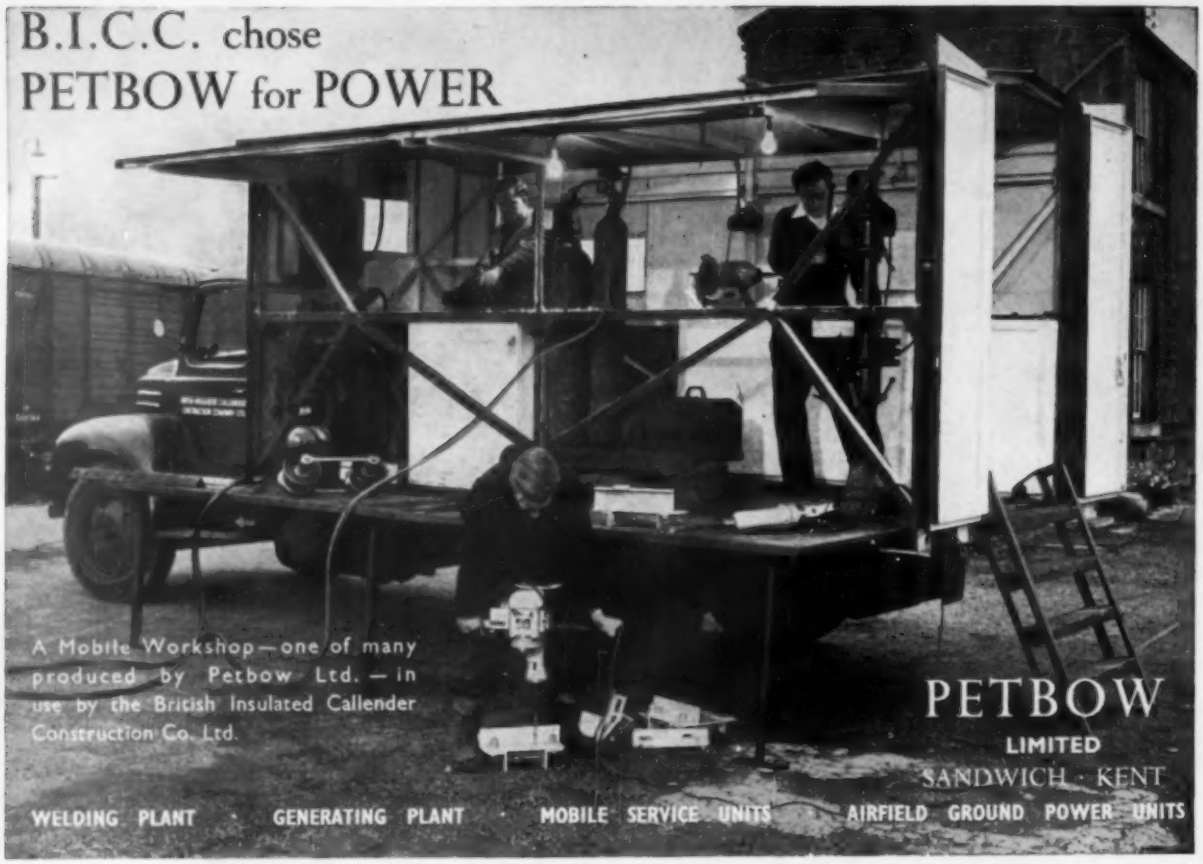

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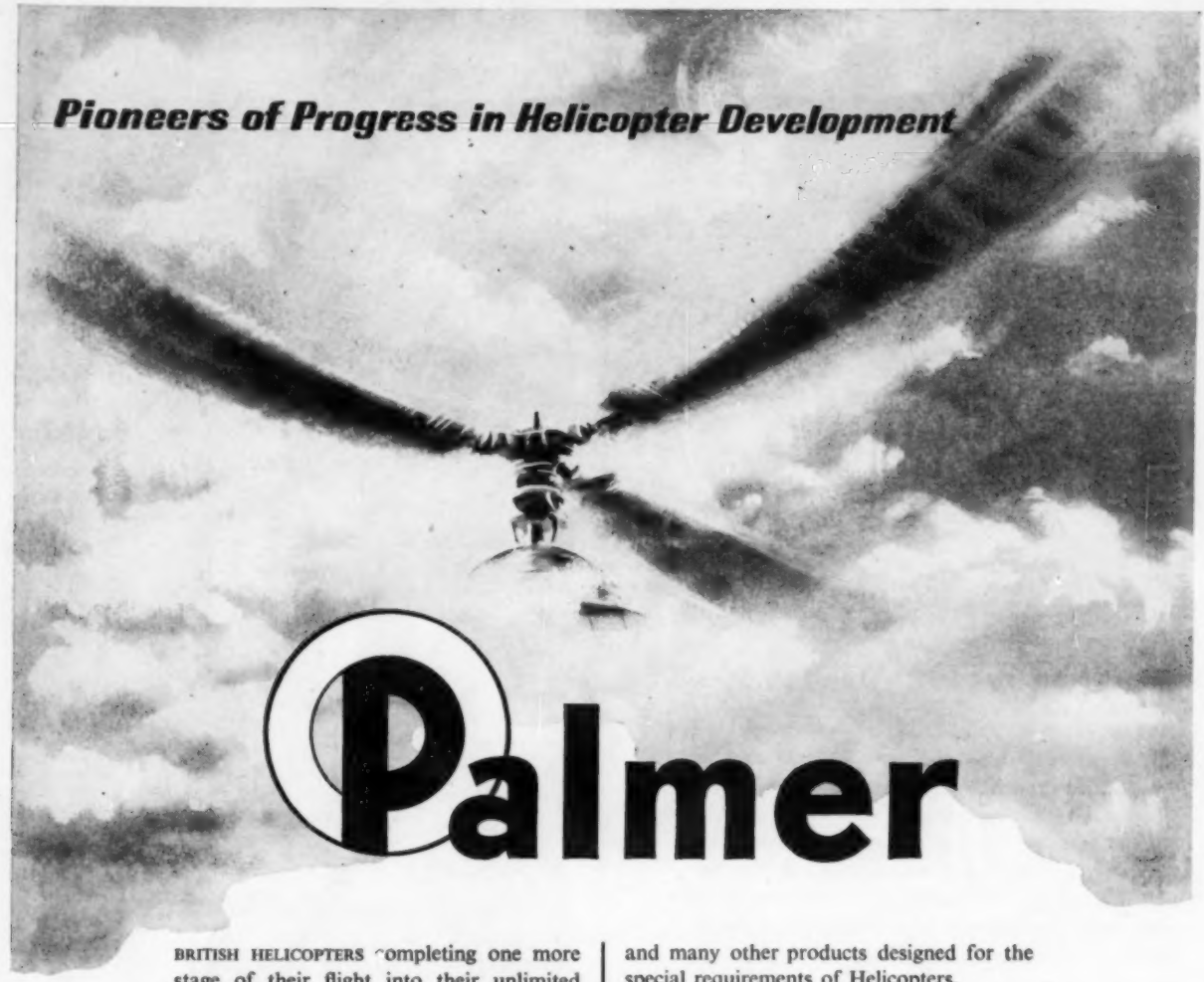

BRITISH HELICOPTERS completing one more stage of their flight into their unlimited future land fair and square onto the front page news—and on Palmer Tyres, Wheels, and Brakes. For Palmer Tyres, Wheels and Brakes are fitted to every British designed Helicopter in use. Palmer are also the pioneers in Britain of Helicopter Floats, special Drip Trays for air-sea rescue work, and many other products designed for the special requirements of Helicopters.

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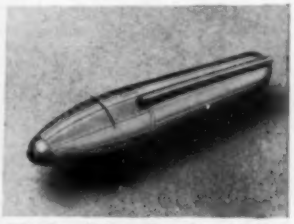

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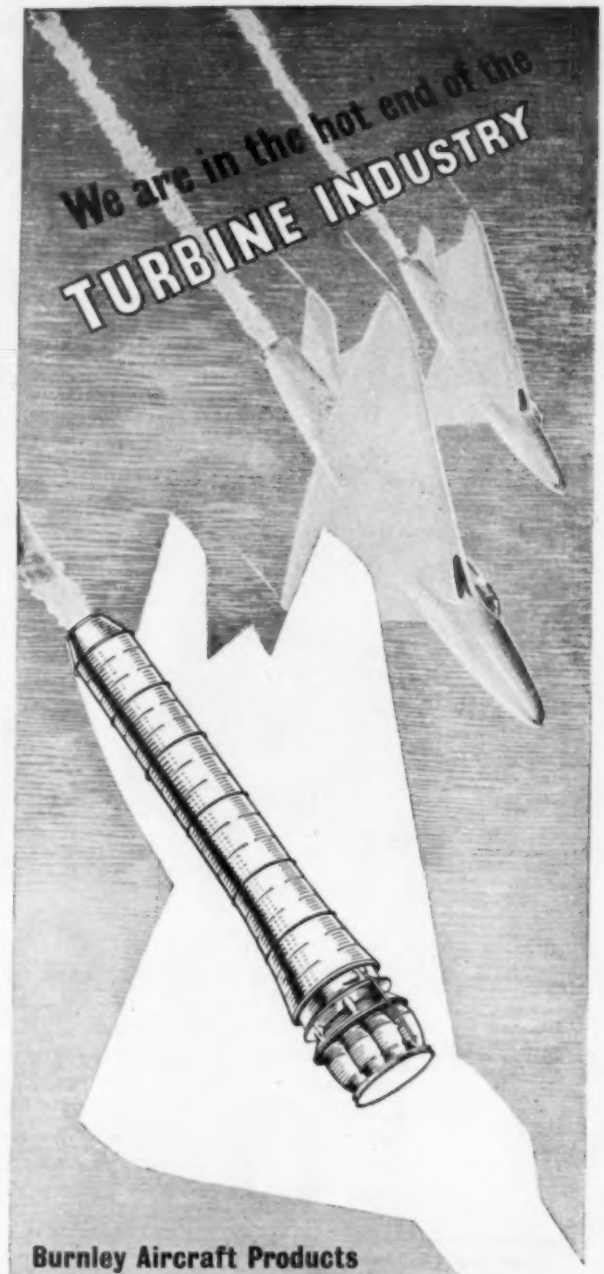

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CAPITAL AIRLINES have underlined their confidence in the propeller-turbine Viscount by placing a firm order for 40 and taking an option on 20 more. This brings total orders, excluding options, up to 143—the value of export orders being over £30,000,000.

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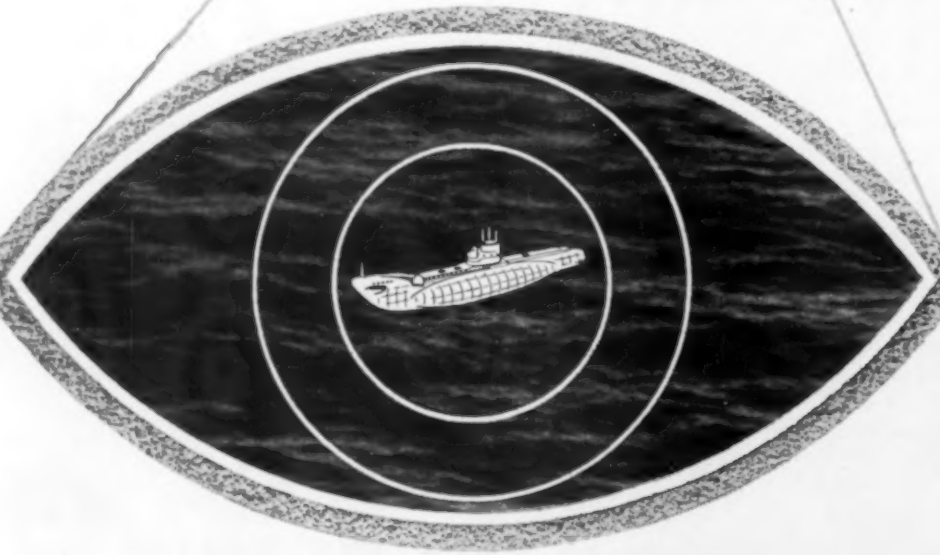
Another Avro advance in long-range sub-hunting!

In the Shackleton Mk. 3, Avro have produced the most powerful and devastating Sub-hunter in the world. Here is still vaster range, still more deadly striking power, still greater search efficiency, still finer crew amenities. New tricycle landing gear also facilitates touch-down after long patrols. The Mk. 3 carries destruction deep into the Atlantic raider's 'safety belt' and gives new protection round the coastlines of continents and in far ocean reaches. In the air-sea-rescue role, it also brings a powerful motorised lifeboat to save the lives of ditched survivors. The Mk. 3 is already in production for R.A.F. Coastal Command and (first export order!) for the Government of South Africa.

THE AVRO SHACKLETON Mk. 3



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First Aeronautical Weekly in the World

Founded 1909

No. 2378 Vol. 66. FRIDAY, 20 AUGUST 1954

EDITOR
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Editorial, Advertising and Publishing Offices:

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

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Avoidable Accidents

NOTHING is more distressing than an accident which occurs through aircraft colliding with one another or with an obstacle. Whereas there are some classes of accidents involving all forms of vehicle of which it can be said they are sad but "one of those apparently unavoidable occurrences," collisions in the air seem to us to be in quite a different and avoidable category.

Recently there have been two collisions involving airliners. Fortunately one did no more than damage the aircraft superficially; the other was disastrous and many lives were lost as a result.

In reporting the occasion when a B.E.A. and an Air France aircraft were in collision over Paris, some newspapers treated the incident with a levity which we, and at least some of the passengers involved, found utterly misplaced. By the grace of God and through no human agency these two aircraft loads of passengers were saved from disaster. Let us have no nonsense about the captains taking a beer together when they got down. This was no brush between cyclists; the first questions to consider are why were passengers exposed to such risks? Whose negligence or lack of foresight allowed such circumstances to arise in (we believe) a controlled area on planned flights? Are the steps to be taken in this area and the regulations in force elsewhere adequate to ensure that there will be no recurrence in the future?

The second collision was still another case of an aircraft hitting high ground—hills that the crew must have known existed, must obviously have intended to avoid, yet in some way stood in the path of the aircraft. This can, we feel sure, be prevented, and we believe that it would be well worth while to set up a committee—within one of the international airline organizations, perhaps—to study every possible angle of this particular form of accident in the hope of devising (or revising) practices and rules which will safeguard aircraft and passengers. Much has already been done to reduce the possibilities; the time has come to eliminate them. We are, of course, appreciative of the good work done by the Flight Safety Foundation of New York. Here we call for concentration on one particular and urgent aspect of an immense problem rather than the analysis of all aspects of accident prevention.

Collision radar which is slowly being adopted in some civil aircraft will certainly help in avoiding mountains, but it is not the whole answer. Consideration might be given to a device like the wartime short-range "squeaker" which was used to warn aircraft, via their radio, of the proximity of a balloon barrage. It should not be beyond practical possibilities to install such equipment on high ground near airfields for use in bad weather and perhaps at night.

In both the examples mentioned, members of the public put their trust in airlines; other people hearing of the occurences may wonder to what extent this trust was well placed.

Recent propaganda in connection with accidents on British roads has suggested that haste rather than speed leads to accidents. This is also very true of aviation. Airline operations are at their safest when a strict, unhurried, carefully worked-out routine is followed. There is little doubt that the latest faster and more powerful airliners are safer in the air than their predecessors. The fact that a flight of a jet airliner must be worked out to the smallest detail in advance, and its speed, height and position kept precisely to the figures planned, decreases the risk of collisions. The ability of such aircraft to climb more rapidly and at a higher forward speed carries them clear of possible obstacles and areas of congestion more quickly. Their very reserve of power is in itself an advantage reflecting favourably on safety. Faster travel means shorter periods of "exposure."

Speed Need Not Increase Danger

The outlook is thus by no means depressing: better aircraft, better equipped, are coming into service each year. But there remains the human element, and here there will no doubt always be room and scope for help and improvement. Some occurrences do seem to be unavoidable today, but perseverence may reduce their number. Where accidents can be avoided, ruthless action is demanded to make sure that they are.

FROM ALL QUARTERS

CANNOCK SPRAY: Defoliation of 120 acres of Scots pine in the forest of Cannock Chase last year led to the Pest Control, Ltd., spraying campaign against the pine-looper moth mentioned last week. The photograph shows Auster Autocar G-AMOY at work.

P.1 = M1 +

THE English Electric P.1 intercepter fighter, powered with two Armstrong Siddeley Sapphire turbojets, has on several occasions achieved supersonic speed in level flight. This excellent news is given in a statement by the makers, who add that the aircraft—which made its first flight on August 4th—frequently exceeded Mach 1 in a dive during its first few days of testing. The P.1 thus becomes the first British aircraft to achieve supersonic speed on the level, and its performance is the more meritorious in that the Sapphires were not fitted with afterburners or any other form of power boost. (France's S.F.E.C.M.A.S. Gerfaut delta-wing intercepter had previously achieved a similar distinction.) W/C. R. P. Beamont, chief test pilot of the English Electric Company, describes the supersonic performance of the P.1 as "completely smooth and highly satisfactory." Normal test flying will continue and supersonic speeds are said to be "now a matter of routine".

It is hoped that the P.1 will make an appearance at the S.B.A.C. Display.

Japan to build Sabres

THE Japanese Defence Board, Government departments and private interests have been studying a plan for the production in Japan of North American F-86 Sabres, and it has been made known that the Defence Board has officially decided to use this type of fighter to equip its air force. It is hoped that the U.S.A. will lend production equipment rendered idle by the change-over from production of F-86s to F-100s.

Meanwhile, the Shin Mitsubishi Heavy Industry Company have signed a five-year contract with North American for the overhaul of Sabres. The contract—which was signed in the U.S.A. by Taizo Shoda, president of the company—also reserved for this firm the right to obtain sole production rights for the Sabre in Japan. The company had already repaired fourteen of these fighters for the U.S.A.F.

R.A.F. Gliding Scholarships

A WELCOME sign that the Royal Air Force remains aware of the value of gliding and soaring as a sport is the announcement that serious gliding by officers, airmen and airwomen at civilian gliding clubs is to be encouraged by a Service subsidy. Under the new scheme, intended to assist those who are stationed far from existing R.A.F. gliding clubs, the major portion of entrance fees, subscriptions and flying charges will be repaid to selected personnel by the R.A.F. Gliding and Soaring Association.

Candidates for scholarships must be regular members of the R.A.F. or W.R.A.F., and must be paid-up members of the R.A.F.G.S.A. On being accepted, they make their own arrangements to join a civil club and pay all charges themselves in the first instance. Flying charges are then refunded at the rate of 2s 6d per launch (winch-launches at most clubs costing about 3s) and 10s per flight; and, after candidates have completed 50 hours gliding, entrance fees and subscriptions are repaid in full. There is no time limit for completion of the 50 hours.

Fifty scholarships will be awarded during the first 12 months of the scheme, after which the position will be reviewed. Although it is intended at present that a scholarship should cover 50 hours' gliding only, candiates may then apply for a further grant.

SOUTHWARD BOUND: Four Avro Shackletons of No. 206 Squadron, Coastal Command, took off from St. Eval on August 12-13th for a 40,000-mile goodwill and training tour the itinerary of which appears on page 253. The crew shown here are (left to right), Sgt. Alborough, Sgt. Hoare, Sgt. Leathborough, Sgt. Connolly, F/S. Guy, Sgt. Smith, F/O. Bristow, F/O. Bird, F/S. Best, S/L. Beresford and G/C. Faville. Members of the ground crew, Sgt. Colton and S. A/C. W. R. Paice, are seen loading a pannier in a Shackleton weapons-bay.

VIEW HALLOO: Right, Hunters — the Hawker, F.1, Avon-powered, sort—awaiting test at Dunsfold. The picture is indicative of the excellent field of vision from the pilot's cockpit and shows to advantage the ports for Aden guns. Four Adens form the standard armament of each Hunter. Below, the first close-up of the Hunter's new dive-brakes. Hawker test pilots Hugh Merewether (left) and Frank Bullen look on.

Ultra-Light Long-Distance Bid Delayed

A PROPOSED attempt on the long-distance record for aircraft up to 500 kg, which was to have been made in Tipsy Belfair OO-TIC by a British pilot, was postponed last Monday. Originally, the flight (1,500 miles, from Newcastle to Casablanca) was to have been made by F/L. Derek Dempster, an Auxiliary pilot of 604 Squadron, but it was decided to try to find a lighter pilot, as F/L. Dempster weighs approximately 14 stone. The sponsors of the flight, the Britvic Company, approached Mr. Fred Dunkerley (12 stone), but eventually it was arranged that F/O. John Lee (under 9 stone), also of 604 Squadron, should attempt the flight.

Last weekend Mr. Dunkerley returned from Gibraltar and Tangier, having made a quick survey of the route. After consultation with officials of the Royal Aero Club, it was decided to postpone the flight due to weather conditions and the political situation in French Morocco.

A Hawker Hunter Destroyed

A SAPPHIRE-POWERED Hunter Mk 2 built by Armstrong Whitworth, Ltd., was destroyed while making a test flight from Bitteswell, Coventry, on August 14th; its pilot, S/L. Martin Walton, ejected successfully at 8,000ft and escaped almost unhurt. It was afterwards stated that the port leg of the undercarriage fell away during a high-speed run over Bitteswell. The pilot found that the hydraulic controls were unserviceable, and that the flaps could not be lowered by manual operation. He decided to bale out, and, while circling to use up fuel, chose an open spot at which to direct the aircraft. After 30 min, S/L. Walton trimmed the Hunter into a steady dive from 12,000ft and ejected at 8,000ft. The aircraft fell in a field about 250 yd from a cricket match at East Langton, Market Harborough, Leics., and was destroyed.

Skysweeper Demonstrated

AMERICA'S replacement for the Bofors light A.A. gun, the 75 mm Skysweeper, was demonstrated for the first time in this country at the Army's permanent range, Weybourne, Norfolk, on August 13th. British observers were impressed by the performance of this automatic weapon, which was demonstrated by the 39th A.A.A. Battalion of the United States Army. Three 12ft-long target aircraft and a towed sleeve were engaged and destroyed by the gun, which fires 12 lb shells at a rate of 45 rounds per minute. The magazine holds 22 rounds and can be changed in less than a minute.

Described as an "artillery machine-gun," the Skysweeper incorporates search radar, computer and gun, all of which are electronic. Approaching aircraft are detected up to 15 miles away and, after a target has been selected by the operator, automatic tracking begins at 22,000 yd. When the target comes within four miles, the firing button is pressed and the gun fires automatically in whatever bursts are required. The cost of a Skysweeper is quoted as $314,000 (£112,000).

U.S. Agricultural Aircraft for New Zealand

A NEW top-dressing aircraft is being introduced to New Zealand. This is the Fletcher FU-24 of which 100 have been ordered by the Cable-Price Corporation, Ltd. These aircraft will be delivered to James Aviation, Ltd., as kits of parts and they will be assembled by this company at Rukuhia. The new aircraft will cost from £6,000 to £7,000.

The FU-24 is a low-wing monoplane, powered by a 225 h.p. Continental engine, having a non-retractable nosewheel undercarriage and a specially strengthened cockpit to provide pilot-protection in the event of accident.

The fertilizer hopper has a capacity of 28 cu ft. With a payload of 1,250 lb the FU-24 takes-off with 216 yd run and has a rate of climb of 600 ft/min. Unladen and with full flap the stalling speed is 40 m.p.h.

Tiltman Langley Acquisition

A MAJORITY of the Ordinary shares and most of the Preference capital of Mid-Century Engineering, Ltd., of Cranleigh, have been acquired by Tiltman Langley Laboratories, Ltd., research and development engineers of Redhill, Surrey.

With the exception of Mr. V. C. Jessup, managing director of Mid-Century Engineering, Ltd., the other directors of this company have retired; their places have been taken by Mr. M. Langley and Mr. L. D. Neeves, managing director and secretary respectively of Tiltman Langley Laboratories, Ltd.

Mid-Century Engineering was formed in 1949 and has complete A.I.D. and A.R.B. approval. Their principal clients were B.O.A.C., B.E.A., Lodge Plugs, Ltd., and Tiltman Langley Laboratories.

Tiltman Langley are extending the capacity of the Mid-Century factory, and a battery of new capstan lathes has already been installed.

Death of Dr. Eckener

THE great German pioneer in airship development, Dr. Hugo Eckener, died at Friedrichshafen on August 14th at the age of 86. He had many friends in this country and he was awarded the Gold Medal of the Royal Aeronautical Society in 1936.

Dr. Eckener joined the Zeppelin company in 1906, and four years later became its manager. He retained this post during the First World War but also instructed airship crews. Later he built two small commercial airships, with one of which a successful air service was maintained between German towns. When the Zeppelin-built *Los Angeles* flew to America in 1921 Dr. Eckener was in command. On the Allied ban on airship building being lifted in Germany, a new craft—the famous *Graf Zeppelin*—was laid down at the Zeppelin works; her most notable accomplishment was a flight round the world in 11 days 23 hr 33 min actual flying time. Programmes of regular flights to South America were successfully completed, but the *Hindenburg* disaster at Lakehurst brought to an end further development of very large airships. After the Second World War Dr. Eckener resumed an earlier connection with the American Goodyear company, but returned to Germany in 1947.

FOLLAND MIDGE

The Viper-powered Precursor of the Gnat begins Flying Trials

AFTER a remarkably short period of gestation, a truly lovely little prototype has emerged into the British aeronautical scene. Created by a wholly new design team, and the first aircraft to be developed by Folland Aircraft for 15 years, it has all the makings of a thoroughbred. And, although it is a completely private venture by the company, its promise is such that, eventually, very large numbers of similar aircraft may be built—and built very easily and cheaply.

The background of the design was outlined in our issue of April 3rd, 1953. It is approximately three years since Mr. W. E. W. Petter, renowned as the designer of the English Electric Canberra, joined Follands as managing director and chief engineer. Of all the projects in his mind at that time, the uppermost was a light fighter, which, while making no sacrifice in performance and few compromises in equipment, could be produced for a small fraction of the cost of fighters then under development.

This project gradually materialised as the Gnat, with the company designation FO.141; and, although governmental backing was conspicuous by its absence, development was steadily carried forward. We made the following remarks at the time, and they are still applicable:

> In spite of the apparent apathy of the Ministry of Supply towards this concept, the whole design seems so obviously correct and natural that it is bound to bear fruit sooner or later. To quote but a few applications, the design is such that it can readily be mass-produced by the NATO countries, which could thereby contribute greatly to their own defence; this contrasts sharply with the present picture in which America has several times expressed dissatisfaction with the return being shown for M.D.A.P. assistance. As an "off-shore" aircraft, it could be a very great dollar-earner, and it would also seem to be an excellent machine for export to countries too poor to buy aircraft of the calibre of the Hunter, Swift and Javelin.

At one time the whole project was placed in jeopardy by the decision of Bristols and the M.o.S. to cease work on the chosen power unit—the Saturn turbojet—but the Bristol company then started work on a much more advanced turbojet, named Orpheus, which should suit the Gnat admirably. Progress with the new engine is now rapid, and it seems certain that it will be available as soon as it is needed for any future Gnat programme.

Nevertheless, the construction of a prototype could not be held up for want of the right engine, and the FO.139 Midge was therefore developed as an interim prototype, and it is this machine which has now begun flying trials. The airframe is almost identical with that of the Gnat, but the power unit is an Armstrong Siddeley Viper 101 (ASV.5 rating of 1,640 lb thrust) of the type fitted to the Jet Provost. With the Midge, Follands expect to prove the airframe, aerodynamics and power systems of the Gnat so that, when the latter aircraft flies in about one year's time, most of the basic problems will have been completely solved.

As the photographs show, the Midge is, to say the least, easy on the eye. It has an air of the Hunter about it, although of course, it is scarcely half the size and one-fifth the weight. The structure is an extraordinarily simple stressed-skin assembly, nearly all the joints (and there are very few, relatively speaking) being riveted. Manufacture of the airframe calls for very little in the way of special machinery, and yet the number of parts involved is about 80 per cent fewer than is required for fighters now in production. Readers may recall the comparisons between the man-hours required to build a Folland wing and the tail-plane of another fighter. Assembly is also straightforward, since cranes and trestles are hardly needed at all.

A pleasant study of the Folland chief test pilot, S/L. E. A. Tennant, in a photograph which also reveals details of the very attractive Midge canopy. The optically flat, rigid gunsight windscreen is fixed to the fuselage, and the blown hood incorporates a light fairing at the front end.

The Viper is contained quite tightly by the rear fuselage, and is aspirated by a pair of lateral ducts. Between these ducts lie the main fuel tanks, which give an endurance sufficient to lift the machine out of the class of "up-down" intercepters. The cockpit, which is pressurized and air-conditioned, is fitted with a Folland-developed lightweight ejector seat. Folland also make the beautiful single-piece canopy, hinged at the rear, which fits closely around the thick, flat windscreen, with a thinner curved outer fairing. We believe this canopy has a lower drag than that of any other fighter. The full instrumentation includes provision for D.M.E. The miniature control column hinges at the mid-point, and the pilot has plenty of room—at least as much as is needed for comfort.

The ailerons and rudder are conventional and are manually controlled. The all-flying tailplane, however, is hydraulically actuated, with the elevators acting as servos. The hydraulic movement is also over-ridden by an electric screw jack which is used for trimming. The wing has a very low thickness/chord ratio, and a sweep angle of 40 deg at the quarter-chord line. It has marked anhedral. It is also worth noting that the horizontal tail surfaces are mounted low. There are no flaps.

The undercarriage is retracted hydraulically, all three units folding backwards into the fuselage. The main units are stressed to permit their use as speed brakes, and they can be lowered, with their attached doors, at high indicated airspeeds. The nose gear has twin wheels, which are castoring; steering is effected by differential brake action.

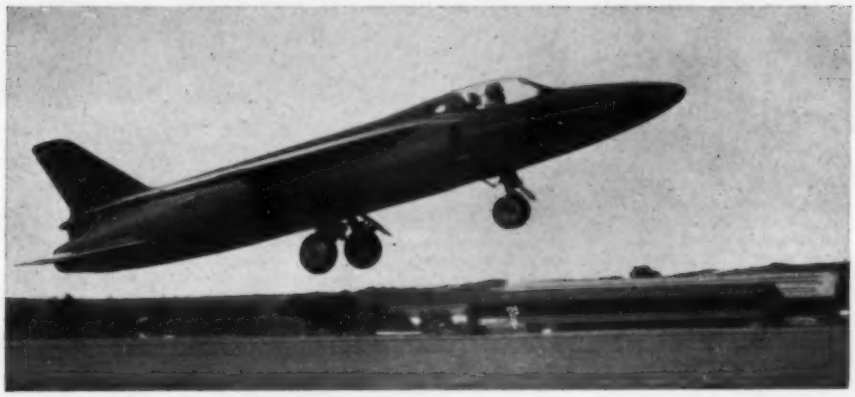
It has already been reported that the eventual Gnat will carry a pair of 30 mm guns, and this would seem to be borne out by the company's statement that the fire-power will be greater than

In this view the Midge is seen to have considerable length ahead of the wing; the main undercarriage and "speed brake" door is also visible.

The Folland Midge is finished in a pleasant shade of greenish-blue. This view shows the tail light, mounted at the rear tip of the dorsal spine fairing.

that developed by four 20 mm guns. On the Midge, provision is made for the chosen armament, but it is not yet fitted. The installation has, nevertheless, been fully developed, together with the associated link-transporting and storing mechanism. The Gnat is also intended to double as a fighter/bomber, in which rôle it will be able to carry a surprising weight of H.E. or napalm, or batteries of 3in air-to-ground rockets. Guided weapons have also no doubt been borne in mind when planning the operational performance of the Gnat.

The A.S. Viper turbojet as reported last week, successfully completed ground-running in the Midge in quick time, and the aircraft was put—without being dismantled—on a normal "low loader" truck at 4 a.m. on Wednesday, August 11th, for road transport from Hamble to the A.



On the left, the Midge is seen at the beginning of the hold-off before touching down. The high angle of attack is, of course, characteristic of swept-wing aircraft, yet it does not result in any deterioration in pilot view. The little windows just behind the canopy will be noted.

Below, the Midge is seen just after touching down, with the all-flying tail at full negative angle of incidence. The fact that the main landing gear retracts into the fuselage has not, it will be seen, resulted in the track being unduly small; the leg and wheel fairings act as speed brakes; there are no flaps.

and A.E.E. at Boscombe Down. There was a minor brush with an Army tank at Salisbury, which put things back one hour, but the Midge arrived at the M.o.S. airfield at mid-day. Within an hour or so, it had been unloaded, the engine run, and clearances signed.

The company's chief te . pilot, S/L. E. A. Tennant, D.F.C., then began taxying trials. He did one hop; then he tried another and, finding himself "too far down the runway" as he put it, decided to fly the Midge right off. He did one circuit to see how things felt and then came in and had the tanks filled. A full half-hour flight then followed, in the course of which the Midge made what one of Boscombe's "oldest inhabitants" called "the finest slow roll I have seen." (S/L. Tennant made seven more rolls above the clouds—and no doubt any other pilot placed in charge of the Midge would have delighted to do the same. Two more flights followed, totalling just under one hour, and S/L. Tennant then flew the Midge across to Chilbolton, where it will be based during further test-flying.

Preliminary indications are that the Midge is going to be a real "winner." Already, S/L. Tennant has commented very favourably on the handling characteristics and, even with one-third of the thrust of the Orpheus, the Midge can exceed 600 m.p.h. The level of performance of the full-blooded Gnat can best be left to the imagination; one point which at once comes to mind is that, with reheat, the Orpheus/Gnat should be quite capable of vertical climb at low altitudes.

From the combat point of view, the Gnat presents a most elusive target. Admittedly, it could not carry all the navigational equipment required for bad-weather operation, but a squadron might be directed by a "master fighter."

Meanwhile, flying is proceeding with the Viper/Midge, and it is intended that this aircraft will take part in the flying at the forthcoming S.B.A.C. Display.

FOLLAND FO.139 MIDGE

(Armstrong Siddeley Viper 101 of 1,640 lb thrust)

Span, 20ft 8in; length, 28ft 9in; height on ground, 9ft 3in; gross weight as prototype, with pilot, fuel and radio, approximately 4,500 lb; maximum speed, over 600 m.p.h. or more than Mach 1 in a dive.

Those responsible for the Midge/Gnat include: W. E. W. Petter, C.B.E., B.A., F.R.Ae.S., managing director and chief engineer; J. A. Boulger, asst. chief designer; R. K. Page, chief technician; R. G. Fowler, chief aerodynamicist; G. Hudson, chief stressman; A. Constantine, asst. designer; David Walker, sen. devt. engineer; F. Stapleton, i/c flutter research; R. Kendall, i/c structural testing; and H. Holt, i/c weight control. (It may be noted that structural testing was exceptionally thorough, and that weight-control was, in Mr. Petter's opinion, more difficult than in any previous aircraft with which he had been associated. "Everything," he said, "had to be just right, otherwise the Gnat would not be competitive.")

NATIONAL AIR TOURING

Pat Fillingham wins the 1954 Grosvenor Challenge Cup

UNDER what were indeed good cross-country conditions—for both power and glider pilots—this year's National Air Touring competition was held at the College of Aeronautics aerodrome at Cranfield on Saturday last, August 14th. With little wind, good visibility, friendly cumulus and only an occasional thunderstorm, it was a pleasant day to be flying in light aircraft. The fact that only just over a dozen owners and clubs had thought it sufficiently interesting to attend—and to fly the course at the expense of the fuel companies—was another sad indication of the present state of this country's flying club movement, but detracted not at all from the enthusiasm of those who did take part, the efficient organization of the Royal Aero Club officials, or the friendly hospitality of the College.

The line-up consisted of the familiar Austers, Messengers, Hornet Moths, and a Gemini, plus J. N. Blair's bright-blue G.A.L. Cygnet, D. R. Robertson's Moth Minor, *Escape*, and the Fairey Aviation company's Tipsy Junior (which was to be flown by Miss Lettice Curtis). At the general briefing, Frank Dismore of the Royal Aero Club, Clerk of the Course, reviewed the contest rules: marks were to be based both on navigational ability and on the handicap formula, which compared speed and fuel consumption of the competing aircraft with those calculated for the type.

Pre-flight planning, carried out in No. 1 hangar, was performed on the assumption that clearance for an overseas flight was required. Correct procedure here counted towards the navigational marks, the other criteria being course-plotting accuracy, E.T.A. accuracy, and identification of landmarks *en route*. The only maps to be used were those officially provided—on which certain highly relevant areas had been erased, "to simulate 8/8th cloud at low level." It transpired that the course was a 196-mile closed circuit with turning points at Broxbourne, Caxton Gibbet, Cranwell and East Carlton.

To conserve fuel, aircraft could be pushed to the marshalling point near the starting line on runway 19. Only one competitor, Miss Curtis in the Tipsy Junior (farthest away from the start) took advantage of this, but then had petrol-feed trouble starting her engine. Day's Gemini, *Maid of Kent*, was first away, followed at 5-minute intervals by the progressively slower machines. The Junior, last to go, was 4 minutes 40 seconds late on take-off; this time could be made up, but petrol consumption would suffer.

With all competing aircraft away, there were 40 minutes to wait before the estimated arrival of the first machine home. Outside the control room a young voice inquired "Mummy, are they racing?" and then, with devastating logic, "Well, what are they doing?" Under the circumstances, "Well, dear, it's a sort of treasure-hunt . . ." seemed a praiseworthy answer.

Close on E.T.A.s the aircraft returned, were taxied back to their precisely marked positions, and were refuelled. Armed with pilots' navigation reports, arrival and departure times, readings of the petrol bowsers' supply gauges—and, of course, slide rules—the R.Ae.C. handicappers got down to some serious work.

Results of the slide-ruling deliberations were announced at a dinner in Mitchell Hall that evening. The Grosvenor Challenge Cup, for the highest-placed private entry, went to Pat Fillingham, flying John Cooper's Hornet Moth (Gipsy Major 1). This machine, flown extremely economically at a 1750 r.p.m., 75 m.p.h. cruise, achieved a consumption of 3.9 gallons per hour. The Coventry Aeroplane Club's Autocrat flown by R. B. Metcalfe, highest-placed of the club entries, won the Siddeley Challenge Trophy. Both trophies were presented by Mrs. W. E. Gardner, secretary of the Australian Women Pilots' Association, who is at present visiting this country with Miss Nancy Evans, the Australian pilot. Col. R. L. Preston, secretary-general of the Royal Aero Club, congratulated the winners, thanked the College of Aeronautics authorities for their co-operation, and thanked also Mr. F. Dismore (who, he revealed, was shortly to leave the Club) for organizing the contest so successfully.

Pat Fillingham, winner of this year's National Air Touring competition, and the Grosvenor Cup.

"FLIGHT" Photographs

Philip Mayne flags away D. R. Robertson, Moth Minor, the only one of its type in the contest.

(Top) The G.A.L. Cygnet entered by J. N. Blair. (Bottom) L. W. Hamp completes his navigational report as his Messenger is being refuelled, two Royal Aero Club slide-rule experts busying themselves at the starboard wing the while.

NATIONAL AIR TOURING COMPETITION 1954 RESULTS

Place	Pilot	Aircraft	Nav. pts. (max. 200)	H'cap formula (max. 100)	Total pts.
1	W. P. I. Fillingham	Hornet Moth G-AEET	183	100	283
2	N. A. L. Thorne	Auster 5 G-AGOH	192	53	245
3	D. R. Robertson	Moth Minor G-AFPN	178	52	230
4	L. W. Hudson	Messenger 4A G-ALAP	192	20	212
5	P. Q. Reiss	Hornet Moth G-ADND	163	38	201
6	Dr. H. N. Gregg	Autocrat G-AHAM	182	13	195
6	Miss L. Curtis	Tipsy Junior G-AMVP	182	13	195
8	L. W. Hamp	Messenger 4A G-ALAI	165	22	187
9	R. B. Metcalfe (Coventry Aeroplane Club)	Auster 5 G-AGYH	168	17	185
10	H. Armitage (Bristol and Wessex Aeroplane Club)	Auster 5 G-AHCN	167	1	168
11	E. Day	Gemini 1A G-AJKS	166	0	166
12	R. Greville-Haygate (Leicestershire Aero Club)	Auster 5 G-AJRN	123	0	123
12	J. N. Blair	G.A.L. Cygnet G-AGBN	123	0	123

R.A.F MODEL CHAMPIONSHIPS

PERFECT weather, good organization, and over 200 enthusiastic modellers representing all Commands of the Royal Air Force made the first day of the two-day United Kingdom Championships at R.A.F. Station Horsham St. Faith a memorable one.

At 0620 hr the noise of the first engine was heard as final test flying started, and although the official preliminaries were completed by 1645 hr flying went on well into the dusk.

The Concours d'Elegance competition produced some exceptional models, and the winners in each section were up to the highest standard found anywhere in this exacting class of the aeromodeller's craft.

With such perfect weather conditions high flight times were soon being recorded, and a Jetex model logged a splendid flight of over 11 minutes.

The Concours model flight-tests showed that those two expert and experienced modellers S/L. L. E. Ellis of R.A.F. Debden and Sgt. J. D. McHard, of R.A.F. Wellesbourne, had once again constructed two most interesting experimental models, the former a delta with a flying tail, the latter a bigger and better black canard, a development of his original "Cucumber." Both models flew exceptionally well.

The first flights of the Scale Model Free Flight contest were watched by a crowd of about 3,000 spectators, who were treated to some first-class flying. The Supermarine Seagull of J/Tech. Percival (R.A.F. St. Athan), after a most realistic protracted take-off from the runway, flew round at scale speed, to be followed by F/O. E. H. Norman's Tiger Moth (complete with travelling Form 700 in the locker) and the intriguing Farnham Flycycle of F/L. Bowmer, which made three determined low-level beat-ups of the crowd before landing.

The Radio Control event gave S. A/C. Lock of R.A.F. Martlesham Heath a chance to show his skill with a five-year-old model of his own design, fitted with a home-made transmitter and receiver. The crowd were delighted with his spot landing which was just five yards short! S/L. Ware of R.A.F. Mildenhall gave a convincing demonstration with his twin-rudder model, ending with an impeccable landing in front of the spectators.

Among the spectators on the second day were the C-in-C. Fighter Command, Air Marshal Sir Dermot Boyle; the C-in-C. Bomber Command, Air Marshal Sir George Mills, accompanied by Lady Mills; the former president of the Association, Air Chief Marshal Sir Hugh Pugh Lloyd; the A.O.C. 12 Group, A.V-M. Crisham, and G/C. Aitken and Mrs. Aitken. Also present were the president of the Northern Heights Model Aircraft Club, Dr. A. P. Thurston, and Mr. Houlberg, president of the S.M.A.E.

At the prize-giving, Air Marshal Sir Dermot Boyle said that it was quality that counted every time, not quantity, and that it was quality he had seen at the Championships. There were also two other things which had impressed him—the ability of a model to be repaired from what appeared to be Cat. 3 to being fully serviceable and in the air in a matter of minutes; the other the tremendous enthusiasm of all the competitors. He ended by saying that there was one thing he would not like to be—a model-maker's mate. For this person seemed to spend all his time running downwind and never getting back in time for anything important!

Dr. Thurston, after presenting the Thurston Trophy to N. A. Gorham of the Ipswich M.A.C., said how very impressed he had been by the progress made by the Association since its formation in 1949; and by the comradeship and common-purpose shown by all the contestants, of all ranks. So the Championships ended, without doubt the best yet.—R. B. L.

Cpl. A. Fell of R.A.F. Feltwell, with his Seraph glider. He was placed second in the A.2 glider event.

F/L. A. Coutts-Smith, competition secretary and contest director, launches his Luscombe Skypal in the Flying Scale event.

NORMALAIR AGREEMENT WITH AIRESEARCH

NORMALAIR have concluded a new agreement with the AiResearch Company of Los Angeles, whereby they are now able to offer British aircraft manufacturers the range of the American firm's components for cabin air conditioning.

Normalair are, of course, already manufacturing cabin pressure controllers, discharge valves, air flow controllers, humidifiers and non return valves, etc. Under the new agreement, they have now taken up the manufacture of air turbine refrigerators and pneumatic temperature control.

FRANK GANNON

WE learn with regret of the sudden death, in Sydney on August 7th, of a well known member of the Australian aircraft industry, Mr. Frank Gannon.

Entering aviation in 1922, he was subsequently associated with the General Aircraft Co., and when they closed down in the early 1930s he leased the factory and formed the business of Turl and Gannon, which later became a public company under the name of Turgan Aircraft. With S/L. L. J. (now Sir Lawrence) Wackett as technical adviser, the company went into production with the six-passenger Gannet (two Gipsy Six); "Gannet" was suggested by Sir Charles Kingsford Smith as being a combination of the names of both Gannon and Wackett.

In 1935 Mr. Gannon resigned from the company in order to establish an aircraft materials and parts section for Paul and Gray Pty., Ltd. At the outbreak of World War II he had developed the only aircraft-material supply organization in Australia, with branches in the various States. He was also responsible for the creation of the D.C.A. release-note system in Australia.

In 1945 he transferred from Paul and Gray to their newly-formed associates Allison Gray and Co., where he established an aircraft agency section. He left in 1952 to form British Aircraft and Engineering Pty., Ltd., Sydney, which represented Blackburn and General Aircraft, Ltd., in that area.

We had pleasure of meeting Frank Gannon when he visited England last spring and the Editor met him again in Australia early this summer, experiencing the great kindness and hospitality for which he was known. He was a keen advocate of British aircraft and of large air transports to open up Australia's outback.

HERE AND THERE

HIGH-SPEED PORTRAITURE: A radar-equipped Venom night fighter of the Royal Swedish Air Force, flying through a snow shower, photographed by flashlight from the tail turret of a Saab S18. It was taken by Ch. Bjernekell. The short streaks of white are said to be the lights of Västerås.

French Canberras

THE first of a number of English Electric Canberra B.6 bombers has just been delivered to the Centre d' Essais en Vol, Bretigny, France. This aircraft has been equipped as a flying test bed and is intended for high-speed and high-altitude experimental work. Other Canberra B.6s are due for delivery shortly.

Sonobuoyancy at D.H. Canada—

AN international sonobuoy working party, including representatives from Canada, the United Kingdom and the U.S.A., were recently the guests of the de Havilland Aircraft of Canada Co., Ltd., at Toronto. Having seen the film *Fifty Years of Powered Flight* and been addressed by Mr. R. Wilson, they toured the plant and the engine division and were given flying demonstrations by the Beaver and Otter and a Grumman S2F flown up to Canada especially for the occasion by the U.S. Navy.

—and a Possible Order

FOLLOWING another demonstration and competitive valuation exercise—Skydrop 2—organized by the U.S. Army at Fort Bragg there is an unofficial report that the chances of the U.S. Army following their Beaver order with one for Otters are very good. It seems that not only did the Otter carry heavier loads than the helicopters—as might be expected—but also it used very little more space to get off the ground.

Aircraft-engineering Physiology

ON "technicians' day" (Monday, September 6th) of the S.B.A.C. Show, members of the Society of Licensed Aircraft Engineers will hear the first comprehensive lecture ever given in this country on the medical aspects of aircraft engineering. The lecturer will be W/C. F. Latham, M.D., B.Sc., Ch.B., of the Institute of Aviation Medicine, and he will speak on, *inter alia*, aural effects of gas turbines and rockets and the hazards inherent in ground pressurization-testing and the handling of potentially dangerous fuels. Attendance at the lecture, which is being given in the main assembly hall of the Royal Aircraft Establishment, Farnborough (with Sir B. Melvill Jones, C.B.E., A.F.C., F.R.S., Hon. F.R.Ae.S., Hon. F.I.Ae.S., in the chair), is confined to S.L.A.E. members and guests.

Harwell Electronics Course

THE ninth electronics course at the Atomic Energy Research Establishment, Harwell, is being held from November 1st to 5th. Intending participants (who must be physicists or electronic engineers holding a degree or equivalent qualification) must notify the Electronics Division, A.E.R.E., Harwell, Didcot, Berks (from whom forms may be obtained) by Oct. 15th.

Service Gliding Show

ON Sunday, August 29th, the R.A.F. Gliding School at Kenley, Surrey, will be open to the public between 3 p.m. and 5 p.m. Various types of glider will be on view, and there will be a flying display, with aerobatics, by both gliders and light aircraft.

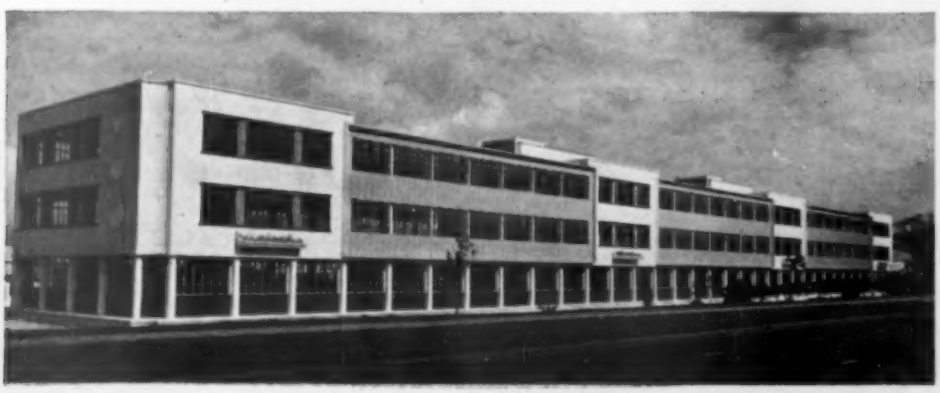
Neptune Tour

ON Wednesday last, six Lockheed P2V Neptunes flown by pilots of the U.S. Naval Air Reserve were due to return to Jacksonville, Florida, after a 14-day summer training flight covering 16,000 miles. The route included the Mediterranean area, the British Isles, Iceland, and Newfoundland.

DEJECTION?: Capt. E. G. Sperry, U.S.A.F., tests a downwards ejection seat from the nose of a B-47 Bomber flying at 500 m.p.h. plus at 10,000ft.

A.O.A. Conference

THE Aerodrome Owners' Association is to hold its annual conference this year in Northampton and Sywell Aerodrome; the period is September 16th-17th.



FOR FUTURE PLANS: The recently completed new design and administration block at Hatfield built for the de Havilland Enterprise by Bovis Ltd. Preliminary plans for this building, which covers 78,000 sq ft, were prepared in May last year and construction occupied only thirteen months.

Specially painted for Armstrong Siddeley, Roy Nockolds' abstract design portrays the tremendous power/speed potential of the Sapphire turbojet.

Chosen to power an impressive list of aircraft for the air forces of the N.A.T.O. powers — the Sapphire develops over 8,000 lb. thrust. With its small frontal area, resulting from an annular combustion chamber, the Sapphire blends well into the aerodynamic forms of supersonic aircraft.

★ ***THE SAPPHIRE*** *is being manufactured under licence by the Wright Aeronautical Division of the Curtiss-Wright Corporation in the U.S.A., where it is known as the Wright J-65.*

The Hawker
HUNTER *F.2 fighter*

The Gloster
JAVELIN *all-weather fighter*

★ *The Republic F.84F*
THUNDERSTREAK *fighter*

The Handley Page
VICTOR *crescent-wing bomber*

★ *The*
MARTIN B57 *(Canberra) bomber*

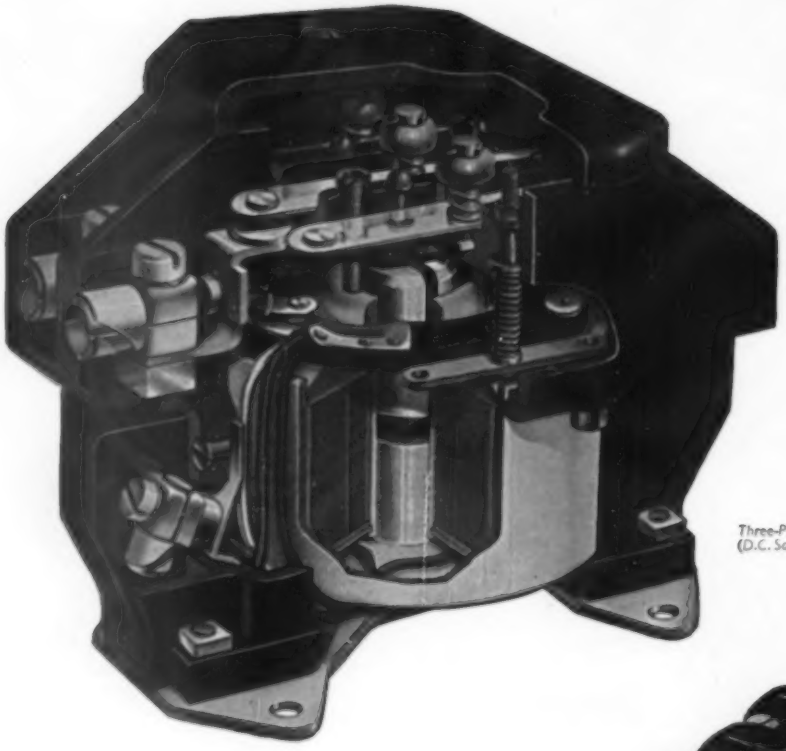
★ *The North American*
FURY *fighter*

★ *The Douglas A4D*
SKYHAWK *bomber*

ARMSTRONG SIDDELEY

ARMSTRONG SIDDELEY MOTORS LIMITED · COVENTRY
Members of the Hawker Siddeley Group

The Electrical Aspect

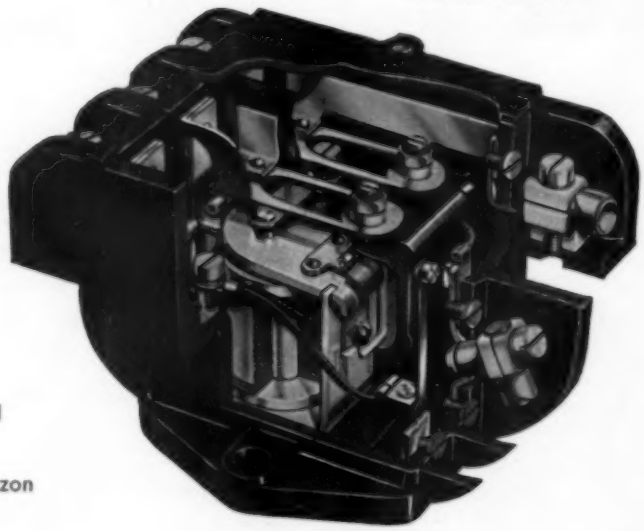


Three-Phase Contactor (D.C. Solenoid operated)

Switchgear . . .

in relation to its application must be light, compact and easily maintained.

Three-Phase Thermal Trip



Extensive developments in the electrical power requirements of aircraft emphasized the need for a three-phase, 208-volt supply. Rotax accordingly designed and manufactured switchgear to keep pace with this new generating system.
Rotax has more experience than any other company in the design, development and manufacture of A.C. and D.C. generating systems and associated switchgear.
The Comet, Hermes 4, Viscount, Ambassador and Brabazon all carry Rotax equipment.

Complete Electrical Systems for Aircraft

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CLEAR-AIR TURBULENCE

—*and Mountain Waves: Correlation of Theory with Pilots' Experience*

By R. S. SCORER, M.A., Ph.D.

DR. SCORER, of the meteorological department of Imperial College, is one of this country's leading meteorologists. His appreciation of the value of meteorological understanding to an aircraft pilot—and of the value of pilots' weather observations to the meteorologist—is the main reason for his writing this article. In it, he suggests an explanation for clear-air turbulence when caused by atmospheric waves. An earlier article by Dr. Scorer, also of direct interest to pilots, concerned an unusual lee-wave experienced over the Isle of Man, and was printed in "Flight" of May 28th last.

MOST of the major meteorological phenomena are reported regularly by the vast existing network of ground observers, and forecasters have a fairly good idea of their frequency and distribution. They do not depend upon chance encounters by aircraft for this knowledge. Even if it is not possible to describe what an encounter with a particular thunderstorm or front will be like, it is generally possible for a forecaster to warn a pilot where or when he can expect to meet such weather and, if necessary, how and why to take avoiding action. Mountain waves and clear-air turbulence, on the other hand, have only lately become of interest, and very little would be known about them without the reports of aircraft pilots—and here I think there is no doubt that glider pilots have made an outstanding contribution to our knowledge, those pilots of powered aircraft who have given the most useful reports almost always having been experienced glider pilots.

Glider pilots have often reported clear-air turbulence in waves in which they have been soaring. Pilots soaring for the first time in the evening wave at Camphill have often been warned that, although it is generally notable for its utter smoothness, nevertheless "there are holes in it." Recently crews of jet aircraft flying at much higher altitudes have found that waves often have an unexpectedly large amplitude between 30,000 and 50,000ft and that their rate of climb has been affected seriously, and they, too, have also found that, though the lift or sink is generally smooth, clear-air turbulence is from time to time encountered. A recent case in which a Canberra aircraft performed an involuntary half-roll on a day when many airline and other pilots reported waves, has focused attention on the question "Is there a connection between waves and clear-air turbulence?"

It must be said to begin with that almost certainly clear-air turbulence often occurs when waves do not. Therefore we can only expect to throw light on half the problem at most.

Any turbulence connected with mountain waves has nothing to do with ground roughness; it is not the result of turbulence created close to the surface spreading upwards. It appears in the *middle* of a mass of air that is otherwise flowing smoothly. It has long been known that if there is a discontinuity of velocity between two layers of fluid the interface is unstable and some sort of turbulence generally appears there. As a corollary it has been inferred that if there was not an actual discontinuity of velocity but a shallow layer in which the shear was large, then that too would be unstable. The question of how large the shear must be has never been satisfactorily answered, and in the atmosphere the problem is complicated because the air is almost always stably stratified—which makes the mathematics much more intractable.

Attempts to use the Richardson number as a measure of the instability have proved practically fruitless. This is a non-dimensional number relating the static stability of the air to the shear, and all that can be said is that it tends to be smaller, according to radio-sonde data, in air streams in which clear-air turbulence is reported. It gives no indication of how deep the turbulence, if any, will be or how long it will endure. This approach is unsatisfactory because turbulence, as soon as it occurs, tends to reduce the shear, and it is not possible to estimate how long it takes to reduce the shear to such a value that the flow is no longer unstable. In aerodynamics, places where shearing flow becomes turbulent are always at or close to solid boundaries which, with the aid of viscosity, have produced the shear. On the scale of clear-air turbulence in the atmosphere the viscosity is negligible, and there are no solid boundaries to make the shear possible. It is at this point that we seek a mechanism for producing shear in mid-air.

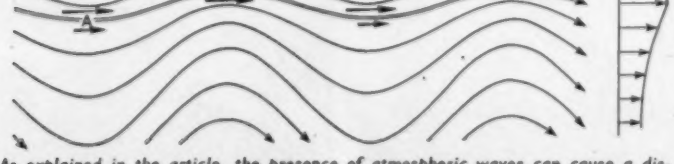
If an air current has mountain waves in it, the amplitude of the waves depends, among other things, on the velocity of the air current. Thus where the velocity is high the amplitude of the waves tends in general to be less than where the velocity is low (this is not true close to the ground or close to inversions but is true for the major portion of an airstream). It can be seen from the diagram that in the lower layer the amplitude decreases with height (as the velocity increases towards the centre of the airstream considered) and the crowding together of the streamlines is greater in the wave crests than in the troughs. This means that the horizontal component of velocity is greater in the crests than in the troughs. In the upper layer, on the other hand, the air velocity in the basic airstream (i.e., the airstream before the waves are induced in it) decreases towards the upper boundary; the wave-amplitude therefore increases with height and so the horizontal velocity is greater in the troughs. The result is that at A the upper layer is shearing forwards over the lower layer, while at B it is shearing backwards. The conclusion is, therefore, that any discontinuity in the variation of wave-amplitude with height will be accompanied by a discontinuity of velocity. Such a discontinuity is dynamically unstable even if the air above and below it is stably stratified.

As mentioned above, the factor which has greatest control over the amplitude of the waves, particularly at great altitudes, is the velocity of the air current, and so we can expect to find turbulence at levels where the *gradient* of that velocity is discontinuous. To illustrate this a velocity profile for the basic airstream (without waves imposed) is drawn at the right of the diagram. Any "corner" in the velocity profile will produce this unstable shearing motion if waves are present.

Jet streams have often been mentioned as being associated with clear-air turbulence. It may be that, for reasons not considered here, turbulence occurs at certain parts of a jet stream when there are no waves but, if such a stream flows over mountains, waves are very likely. Furthermore, jet streams do frequently have velocity profiles with "corners," although they are not the only such airstreams.

One interesting sidelight is that before this was properly understood some meteorologists had examined the equations for mountain waves and had come across the coefficient (which we usually denote by l^2) $g\beta/|U^2-U''/U$. Here U is the velocity of the basic current and U'' is the curvature of the velocity profile so that where U'' is large we have a "corner" in the velocity profile. β is the static stability, and it was in this coefficient, and nowhere else, that it entered into the equations. The argument was that if U'' were very large then this coefficient would become negative and the effect would be the same as having a negative stability, so that turbulence would be expected. For various reasons this argument is unsound, but it led these workers to the discovery that clear-air turbulence was very often associated with large values of U''. All that evidence now, of course, supports the present theory!

We are a long way still from being able to predict turbulence accurately, but we have at least a somewhat clearer idea of *one* of its causes. This should give both aircrew and meteorologists an understanding of the probable mechanism of turbulence in waves, and so a better idea of what are the significant things to report when clear-air turbulence is encountered.



As explained in the article, the presence of atmospheric waves can cause a discontinuity in the horizontal velocity of an airstream at an interface where the velocity gradient changes sharply. The directions of shear at crests and troughs are opposite: this discontinuity is unstable and may produce clear-air turbulence. Here the spacing of the streamlines is inversely proportional to the velocity.

WORLD PARACHUTING

Britain's Part in the Second Championships at St. Yan

By T. W. WILLANS*

WHEN I suggested to Sir Raymond Quilter that his company might lend a few parachutes for a British team in the Second World Parachuting Championship, his answer was characteristic. "Give them everything they need." I pointed out that "everything" in terms of pounds, shillings and pence might be rather frightening. The reply was short. "Take care of the technical side—the rest is my business."

The first problem was in finding a team of five parachutists qualified to the International "C" licence standard, and eligible for entry in the competition. Of the half dozen or so with this qualification, only one, A. J. Harrison, was available for trial. The remainder had to be found and trained—and little more than six weeks remained before the start of the competition.

Wing Commander Blythe, commanding the R.A.F.'s No. 1 Parachute Training School, was asked if he could supply a number of instructors for training to "C" licence standard. This meant that they would each have to make 20 descents with a manually operated parachute in addition to the large number of static-line jumps that he had already completed. Jimmy was enthusiastic, as apparently were his entire staff, and the suggestion was put forward to the Air Ministry.

Considering the complete novelty of the situation, things moved fast, and with about four weeks to go, authority was given for practice to begin.

In the G.Q. factory, this decision really threw a spanner into the works. Thirteen new, non-standard parachute outfits were required for the competition, and instructions were given to produce them forthwith. Heads of departments could be seen operating sewing machines as the pressure was applied, and the projects department were in need of an armed guard as they ruthlessly pulled apart the finished products and returned them to the shops for modification.

Practice started with a couple of ancient and battered trainer main parachutes, and the residents of Weston-on-the-Green must have been horrified to see bodies hurtling freely from R.A.F. Hastings aircraft, where before they had been arrested smartly just outside the aircraft door by the trusty statichute.

It was ducks to water for the R.A.F. instructors, and when the first G.Q. Blank Gore parachutes began to come off the line, enthusiasm was high. These parachutes, in which one complete gore is removed from top to bottom, leaving only peripheral and apex bands, have a built-in drift of approximately two metres per second. This is achieved through the jet effect of air flowing out through the blank gore. The parachute may be rotated completely in about four seconds by finger operated control rings, and the jet effect applied in any desired direction. There is little oscillation.

After the first few drops, G.Q.'s Rapide became available, and

The new world champion parachutist Fetchichine of U.S.S.R. (centre) on the dais at St. Yan; on the left is his team mate and runner-up Marutkine. Third place went to Sam Chasak of France.

British team: (left to right) Sir Raymond Quilter (pilot), T. W. Willans (capt/dispatcher), T. F. Moloney, A. J. Harrison, W. T. H. Hay, J. Hoffman, H. Wood and D. Sutton (reserve). Mlle. Seliverstova, U.S.S.R., lands close in to the target (left) after a low descent. A. J. Harrison leaves for a precision drop (below), wearing the British "blank-gore" parachute which caused considerable interest among competitors, particularly the Russians.

* *The author, who was captain/dispatcher of the British team, is technical sales executive of the G.Q. Parachute Co. He secured fourth place for Britain in the first World Parachuting Championships, held three years ago in Yugoslavia.*

Relaxation: (left to right) J. Beadle "figure man"; a pretty South African supporter; Pete Huggins, Decca operator; Pierre Lard, last World Champion; "Timber" Wood; W/Cdr. Blythe, O.C. No. 1 Parachute Training School, R.A.F.; Arthur Harrison; and Alf Card, British member on the competition jury. In the background, a parachuting Stampe and the British Rapide G-AJHP. A Russian competitor (right) holds in his left hand the acoustic audio timer, which gave the jumper one signal when it was time to reach for the ripcord, and a second signal to pull.

as it was difficult to place this aircraft visually over a point on the ground, it was decided to drop blind, using the Decca Navigator which was already installed.

Because of lack of experience in the use of Decca for this particular purpose, and because of the location of the Flight Log behind his left shoulder, Sir Raymond, the pilot, decided to call in the experts. Decca's own pilot, Capt. Peter Huggins, was installed in the navigator's compartment, where he practiced his Decca witchcraft and passed the necessary instructions to the pilot.

As dispatcher/instructor for the operation, I had stated firmly that I did not believe in new-fangled devices, and cried loudly for an Auster and the use of the human eye. However, after Pete's first day of knob-twiddling and pen-driving, I began to feel that there might be something in the system after all. I have reluctantly to admit that my confidence in the equipment grew steadily thereafter.

Ten R.A.F. instructors had been selected for training up to approximately ten manual jumps, after which further selection was to be made. Delay times before opening the parachute ranged from three to twelve seconds, and drops were initially from between two thousand and three thousand feet. There was a certain amount of dismay on the ground when one parachutist, jumping from a Hastings with a standard trainer main parachute, descended with one gore completely missing and considerable damage to the other side. Apparently unmoved by the situation, and declining to follow the shouted advice to "pull your reserve," he proceeded to slip his battered relic towards the target and finished with a masterly stand-up landing.

With time shortening rapidly, the Rapide became unavailable and operations were removed to Fair Oaks where Winco Arthur, the C.F.I., threw his Austers into the fray. At this stage John Beadle, G.Q.'s chief project engineer, also became chief pilot, and for several long days circuited and bumped while parachutists climbed in and fell out with monotonous regularity. During this period I was able to co-operate in aiming and dispatching from a precarious semi-recumbant position, and on one memorable occasion the pilot/bomb aimer combination helped five parachutists in succession to battle their way to within spitting distance of a point marked on the ground. We did, however, have our bad days!

At this stage, the team read as follows: F/S. A. W. Card, A.F.M., F/S. H. Wood, Sgt. J. Hoffman, F/L. W. T. H. Hay, Sgt. T. F. Moloney, F/S. D. V. Sutton and A. J. Harrison. We were allowed to enter five men for the championship, and that meant that two had to fall back to reserve. No one relished having to make the selection.

Enrico Milani, popular Italian parachutist and songster, wearing the Lise static line parachute which, after development, may be collapsed by means of centre-lines to accelerate descent. He was presented with a blank-gore parachute after he had made a perfect delayed drop from the British Rapide.

FINAL TEAM POSITIONS*

Place	Name	Points			Total
		A	B	C	
1	U.S.S.R.	672	610.5	579	1,861.5
2	Czechoslovakia ...	550	534.5	514	1,598.5
3	France	582.5	453.5	451	1,487
4	Yugoslavia ...	551	527	351	1,429
5	Great Britain ...	400.5	388.5	303	1,092
6	Italy	339	187	175	701

Column A: mean of points won in two jumps from 1,500m with 20 sec delay.
Column B: mean of points won in two jumps from 650m with immediate opening.
Column C: total points won in stability test (any height above 1,500m); 20 sec delay with 15 sec stable position.

* Team positions based on points won by three highest-scoring members of each team; the single U.S. representative was thus unable to qualify.

With one day left before departure for France, the team moved back to Weston for practice in 20 second delays. Frank Dodds, the only full-time parachute packer available, had been working long hours to produce sufficient parachutes for practice, and with the factory closed for holidays, both John Beadle and myself had been working until late at night, sometimes sleeping in the factory when it was too late to go home. The parachutists were getting desperately tired, and we had to admit that we were asking too much of them. They had, however, qualified for their "C" licences with 20 jumps apiece, including two delays of twelve seconds.

The last night of practice in England was, for the British team, within an ace of being disastrous. Landing at Abingdon, brake trouble caused the Rapide to leave the runway on touchdown, damaging the lower starboard mainplane. With the machine unserviceable, it looked for a moment as though the competition might have to be abandoned.

We still had seven men to drop on 20 second delays, and while we watched R.A.F. engineers working on the machine, precious time slipped away. Thanks, however, to the good work of the R.A.F., the machine was ready in time for four drops before dark. The other three parachutists would have to make their first long delays in France.

The return to Fair Oaks that night was the first occasion on which the Rapide has made use of the flare-path newly installed on that field.

Most of the equipment had left by road for the airfield at St. Yan in Southern France. The Rapide followed *via* Paris, and the main part of the team Valettaed to Lyon-Bron, thence by motor bus. The whole team was settled in at St. Yan and Digoign by the evening of July 31st and practice started on the morning of August 1st.

The French team were the only other parachutists present on the airfield. The remainder were to meet in Paris for a reception on the morning of the 2nd. But celebrations, for the partly trained British team, would have to wait until later. Operating on the French Decca chain, and using the master station at Mont Lucon and slave stations at Chalons and Aurillac, the Rapide was soon estimated to be obtaining a 25-yard accuracy on its Flight Log, for which a special large-scale chart had been provided.

N.-S. and E.-W. lines had been drawn in on the chart, and these intersected approximately in the centre of the airfield. The aircraft was taxied to the cross which marked the landing target, and its actual position was plotted. It was then quite simple to draw in a line through the target, giving direction of the dropping run, corrected for wind. In flight, the pilot was talked on to this line, and the dispatcher directed to unload the parachutist at a selected point upwind of the target. The set used in this case was the Mk 8 Decca receiver, with Mk 01 Flight Log.

The competition was divided into three parts. First a pair of descents from 1,500 m in which a free fall of 20 seconds was to be

(*Continued on page 244*)

WEST-AFRICAN SAFARI

Along the New Colonial Coach Route with Hunting-Clan

FOLLOWING the success of the original Safari Colonial Coach services to East Africa, which were opened in June 1952, and the subsequent Rhodesian Safari to Salisbury, Airwork and Hunting-Clan Air Transport applied for permission to operate a similar service between the United Kingdom and West Africa. Approval for this operation was granted and in June this year the new route was opened by the Airwork Viking G-AKTU. The services are operated on alternate weeks by each company, giving an overall weekly frequency in each direction. The first Hunting-Clan Air Transport service to Accra left Bovingdon on June 21st and the photographs on these pages were taken during the operation of that service.

The Airwork services depart from Blackbushe and those of Hunting from Bovingdon, after which both companies' aircraft fly *via* Bordeaux, Tangier, Agadir, Villa Cisneros, Dakar, Bathurst, Freetown and Abidjan to Accra. Tangier and Dakar are night stops in each direction, and rights have been applied for but so far not obtained for a traffic stop at Takoradi. Royal Mail is carried outward to Dakar and in both directions between London and Bathurst, and London and Freetown.

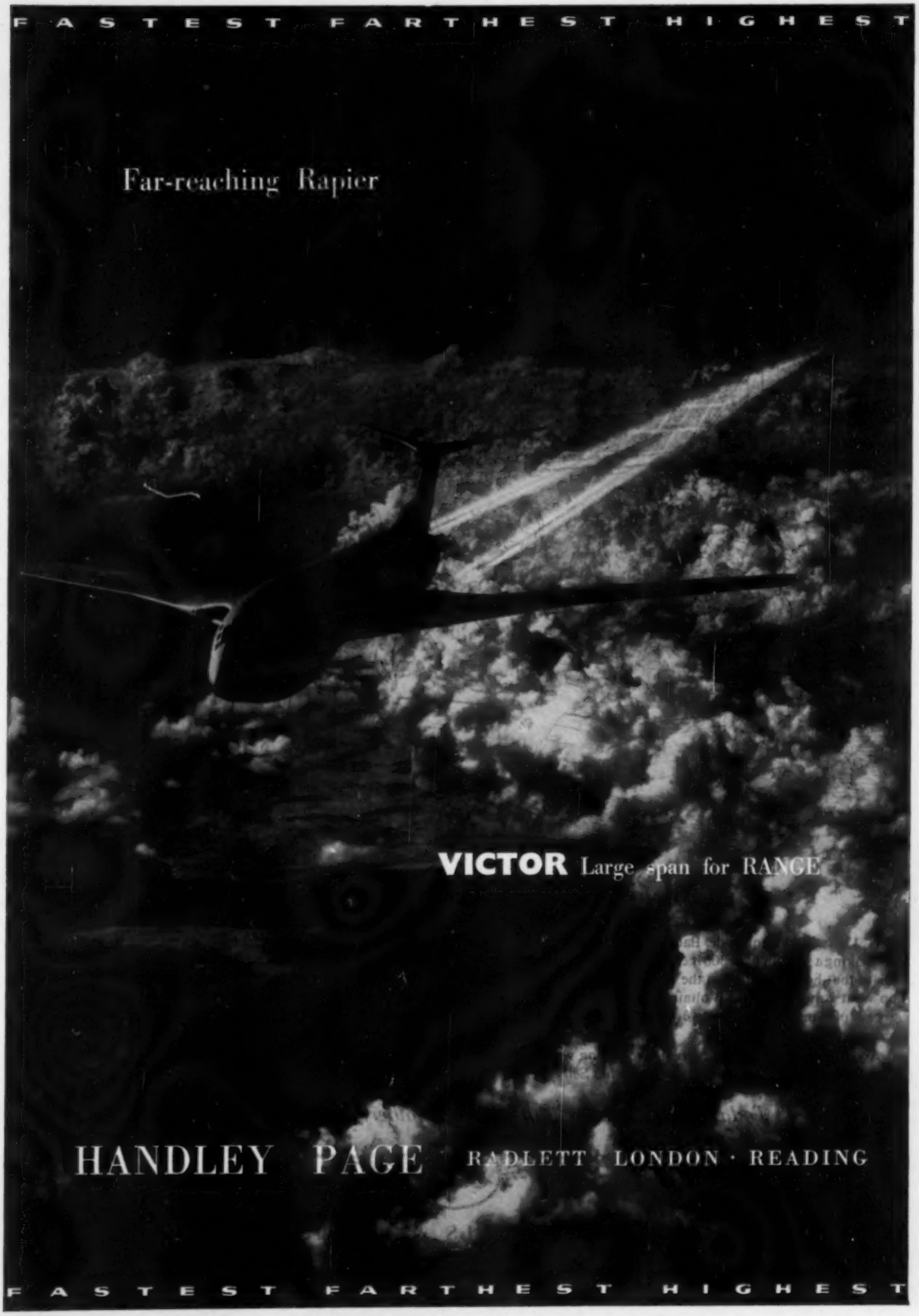
The Safari services offer a pleasant way of seeing the route. The operating height with the unpressurized aircraft gives a good view of the countries flown over, while the short stages with refuelling halts and night-stops offer glimpses of varied peoples, customs and ways of life.

The first sector provides views of the invasion beaches and a considerable amount of France and terminates with a French lunch at Bordeaux's Merignac Airport. The next sector crosses the entire length of

(Top) West African Airways' Bristol 170 services carry a high proportion of African nationals. This embarkation scene at Accra on the Gold Coast is typical.

(Centre) International scene at Villa Cisneros with a French Air Force Languedoc, Spanish Air Force Junkers-Ju 52/3m and Hunting-Clan Air Transport Viking.

(Right) The Bordeaux to Tangier sector provides a view of Barajas Airport, Madrid. The new terminal buildings under construction can be seen in the centre.


FASTEST FARTHEST HIGHEST
Far-reaching Rapier
VICTOR Large span for RANGE
HANDLEY PAGE RADLETT · LONDON · READING
FASTEST FARTHEST HIGHEST

A page from
THE ESSO HISTOIRE OF AERIAL LOCOMOTION
Adapted from the French de P. Crochet-Damais. Illustrated par Philippe Féty avec permission.

DE BACQUEVILLE AND THE LAUNDRESS

IN 1724 the Marquis de Bacqueville astonished Paris by making a solo flight of 300 metres. Contemporary chronicles relate that he took off from the flat roof of his hotel (situated on what is now the Quai Voltaire) in a machine consisting of a pair of wings "*semblables à celles que l'art chrétien prête aux anges.*"

According to Gérard de Nerval, everything went well until the Marquis reached the middle of the Seine. Then he stalled and pancaked aboard a craft making its way upstream. Other authorities contend that the Marquis landed sweetly and according to plan, for it so happened that the barge was full of laundresses, one of whom was pretty enough to attract the eye of the brave aerial navigator.

For a time at least the Marquis de Bacqueville was able to forget the problems of aeronautics and indulge his taste for dalliance. It was ever thus.

Today genius gets results by remembering that it pays to say

ESSO

AVIATION FUELS & LUBRICANTS

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON, S.W.1

One of U.A.T.'s fleet of de Havilland Herons at Yoff Airport, Dakar, in Senegal. This aircraft was being prepared for departure on service to St. Louis.

WEST-AFRICAN SAFARI . . .

Spain, and Madrid can be seen with its fine background of the Sierra de Guadarama. Just before leaving the European coast the Rock of Gibraltar is visible away to the east and the runway of North Front Airport can be seen.

Tangier is a pleasant place for the first night-stop and the schedule provides a mid-afternoon arrival with time for sight-seeing. Rabat and Casablanca are almost beneath the track to Agadir and the Atlas mountains to the east produce some fine cloud formations. On the Hunting inaugural flight Agadir was overflown in each direction and the 1,000 miles plus Tangier to Villa Cisneros stage was made nonstop in just over five hours. From Agadir to Villa Cisneros the route lies over long stretches of sea and desert and Villa Cisneros itself is much more like the Persian Gulf area than Africa. The airport is simply a marked-out area on the hard sand.

The next stage to Dakar involves further desert and sea crossing, and the night stop provides the first contact with the real tropical Africa. From Dakar the route is along close to the coast and the scenery consists mainly of bush, winding rivers, swamps and an occasional village.

Bathurst, Freetown and Accra are all West African Airways stations and the friendliness and efficiency of the Corporation's staff at each place is of a high order. Freetown is one of the most attractive calls on the route; the airport is 117 road miles from the town, and passengers are carried by launch from the town to Lungi Airport, but there is a rest house at Lungi surrounded by tropical trees and flowers and it looks down on to a fine beach where fishing seems always to be in progress. Brightly coloured birds complete this scene.

At Abidjan there is a fine airport building with a well-run bar and refreshment room. At Dakar a hangar has been converted for passenger handling—as shown in one of the photographs reproduced here—it has been given a modern façade. The airport buildings in the British territories are makeshift affairs of a primitive nature. However, in spite of this, the journey is most enjoyable and the Safari services are providing a useful part of communication to that great and fascinating African Continent.

J.S.

(Above, top) Hunting-Clan Air Transport's Viking refuelling at Villa Cisneros, Rio de Oro, on the first Hunting operated West African Safari Service. (Bottom) The smart fire unit at Bathurst in Gambia. This friendly and efficient team seemed happy in gum boots and red tin hats in spite of the high temperature.

One of T.A.I.'s DC-6Bs leaving Abidjan, French Ivory Coast, for Bamako, Bordeaux and Paris. One of these DC-6Bs on a delivery flight flew non-stop from California to Paris.

AIRCRAFT INTELLIGENCE

Great Britain

English Electric P.1. This supersonic twin-Sapphire intercepter, which first flew on August 4th, was in the air again the following day. It is expected to make its first public appearance at the S.B.A.C. Display.

U.S.A.

Last Convair B-36. August 14th was the scheduled delivery date for the last production model of the B-36 to the U.S.A.F. Since B-36 deliveries began in 1947 Convair's Forth Worth division has built more than 380 of these Brabazon-size bombers for Strategic Air Command. Man-hours of work on each machine were reduced from 350,000 to 142,000, and the B-36J—the last production variant—has only 20 per cent of parts in common with the original B-36A. Gross load increased from 258,000 lb to 408,000 lb, and power from 14,000 h.p. to an equivalent of 36,000 h.p.

New Cessnas. Pressurization will be a feature of the Cessna 620 8/10-passenger "executive" aircraft to be flown early next year by the Cessna company. A low-wing machine with a nosewheel undercarriage and single rudder, it is to be powered with four six-cylinder geared and supercharged Continental GS0526s each of 320 h.p. Cruising speed should be about 250 m.p.h. Meanwhile, the Cessna CH-1 light helicopter is said to be approaching its certification stage. Gross weight is about 3,000 lb and the engine a supercharged Continental FS0470 of 260 h.p. The single main rotor has all-metal blades.

Rotary-wing McDonnells. The XV-1 convertiplane for the U.S. Army and U.S.A.F. is now undergoing flight trials. This machine, which was illustrated in our special Helicopter Issue of March 12th this year, is a high-wing monoplane with twin-boom tail, and is driven by a Continental radial engine of 550 h.p. At the same time, work is going forward on the XHCH-1, described as "a cargo unloader or flying crane" for the U.S. Navy.

PINWHEEL: This rocket-propelled research helicopter is the subject of a note on this page.

Rotor-Craft Pinwheel. In last week's issue a photograph and brief particulars were given of the Kellett KH-15. We now reproduce, on this page, a picture of the latest development of a companion type, the Rotor-Craft Pinwheel. This was originally started some four years ago as a research project at the Office of Naval Research but development was continued under a Bureau of Aeronautics contract to explore the field of rocket propulsion for helicopters. Tests are at present under way with the "saucer-type" undercarriage shown. The designer's ultimate aim, it is said, is to perfect the craft to the extent that it can be flown strapped to a pilot's back, without undercarriage. The tiny rocket motors are claimed to be the first in history to be throttle-controlled, and are fed by a "flameless liquid chemical fuel." They accelerate the blades to flying speed in less than ten seconds. The Pinwheel has no electrics, no oil system, hydraulic system, transmission, starter or generator, and the pilots' single control is a motor-cycle-grip hand throttle.

PIASECKI H-21C WORK-HORSE
(Wright R-1820-103)

Rotor diam.	44ft
Fuselage length...	52ft 6in
Overall length	86ft 4in

France

Morane Saulnier M.S. 760. This jet-propelled four-seater tourer is a development of the M.S. 755 Fleuret side-by-side jet trainer, which, notwithstanding its manifold qualities, was not ordered in series by the French Air Force, though foreign contracts are still expected. The M.S. 760, made its first flight on July 29th and is likewise powered with two Turbomeca Marboré 2 turbojets. Basic structural elements of the M.S. 755 are incorporated, though the cabin—pressurized to the equivalent of 9,800ft at 19,700ft—is larger. Provision is made behind the four seats for two suitcases. Provisional and approximate data are: span (without tip tanks), 30ft; length, 31ft; wing area, 193 sq ft; weight empty, 4,400 lb; gross weight, 7,275 lb; wing loading, 27 lb/sq ft; max. cruising speed at sea level, 420 m.p.h.; max. cruising speed at 20,000ft, 358 m.p.h.; initial rate of climb, 2,500ft/min; service ceiling, 36,000ft; take-off run, 975 yd; max range without tip tanks, 560 miles; max. range with tip tanks 870 miles.

Fouga C.M. 170 Magister. Three of these light jet trainers participated in the NATO demonstration at Villacoublay last month and in three days made a total of 35 flights. Passengers included cabinet ministers and 18 military pilots belonging to the air forces of the U.S.A., Great Britain, Italy, Greece and France. On several occasions a Mach number of 0.82 was achieved and the aircraft were frequently spun for the edification of observers.

Air Power at Sea

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Much of the Navy's striking power rests in her carriers, a large proportion of whose aircraft now as hitherto are of Fairey design and construction.

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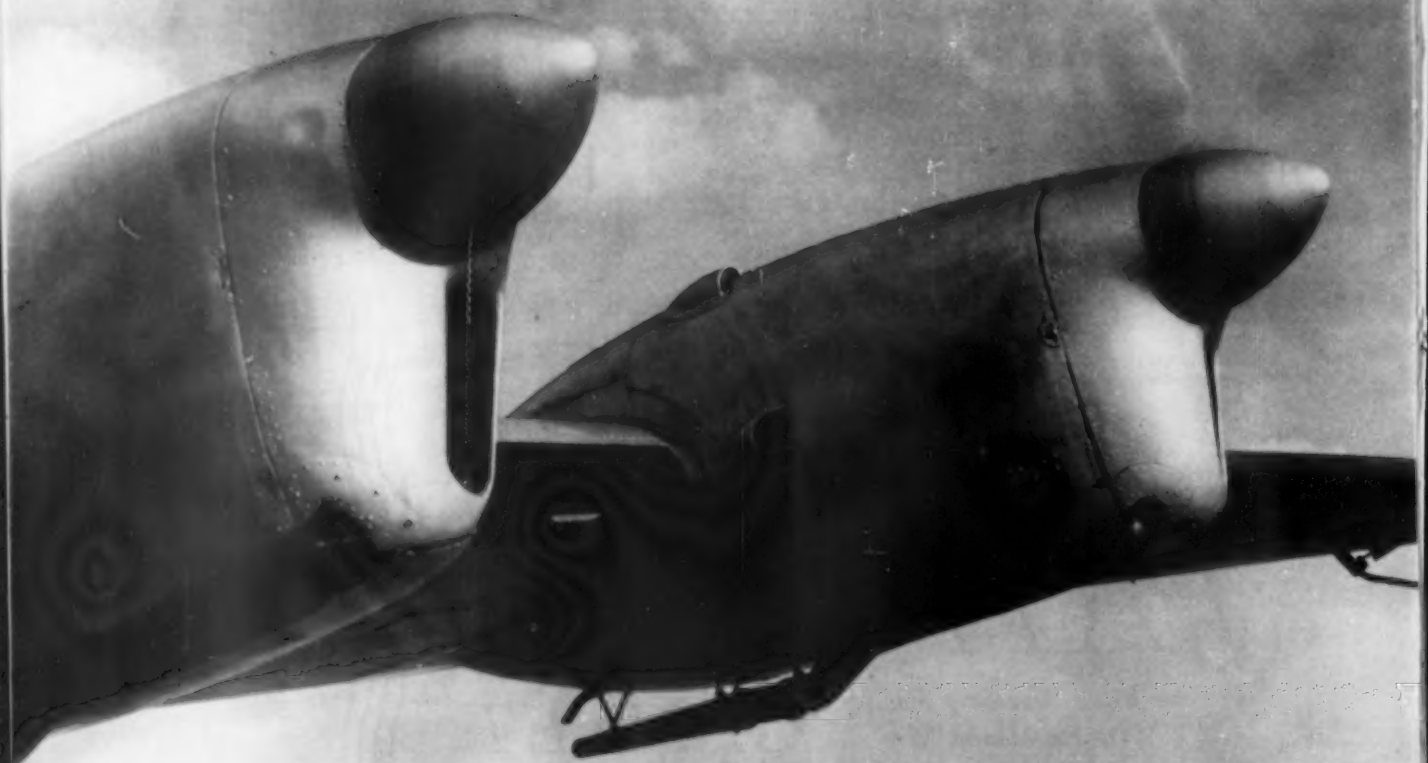
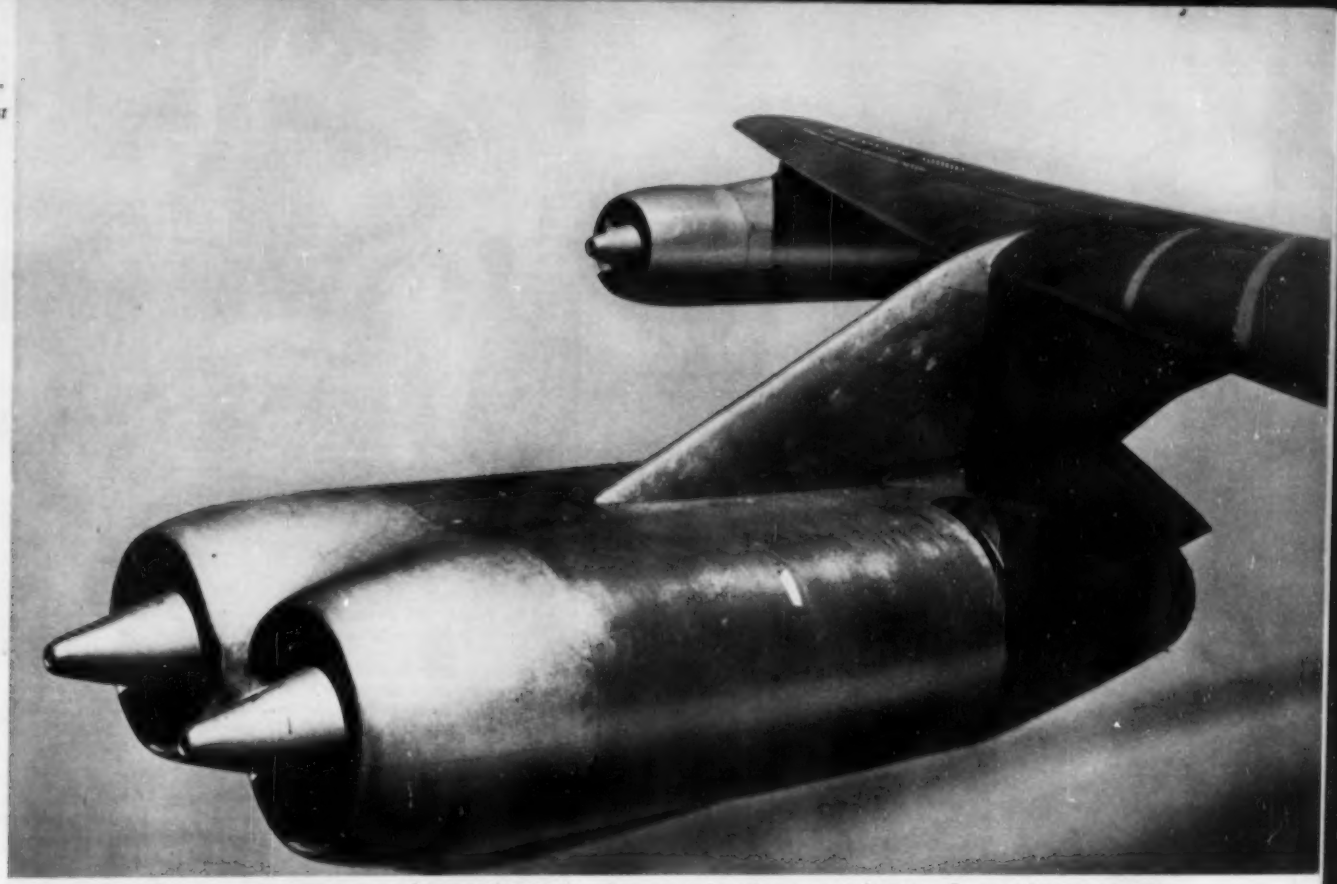


D.H. ENGINES



A new angle on pods and sweep, and surely a most striking view for any pilot to gaze upon.

BOEING B-47E IN THE AIR

NUMBER 52 OF THE SERIES

By THE EDITOR

FAMILIARITY is said to lead to contempt, but this is certainly not an inevitable outcome. There are very few who, having been associated with aircraft and the art of flying to an extent that would justify a claim to be familiar with them, fail to hold them in increasing respect. It has been my privilege to fly a quite large number of different aircraft types, and in the main they have been pleasant enough to handle. One thing is certain as a result: that, far from any *blasé* attitude developing, my respect for aeroplanes has grown; and this is not only due to the natural caution or "incipient twitch" which come with mounting years.

When, quite recently, an opportunity was offered to fly in and handle a B-47 I admit that I was more than excited about the prospects and I would have been very disappointed if circumstances beyond my control had prevented it. The agreement of the makers to the proposal was whole-hearted, and a personal appearance at the Pentagon at Washington, D.C., was, I think, instrumental in producing one of the quickest "yesses" ever to emanate from the teeming spokes of that massive edifice. For the approval, and the quickness of its granting, I am genuinely grateful.

One month to the day later, I presented myself at the Boeing Plant at Wichita, Kansas, having learned of the receipt of an official signal giving clearance for the flight and having been assured of the warm welcome which I had grown to associate with my visits to Boeing establishments.

Wichita was enjoying one of its very infrequent rainstorms at the time of my arrival in the area, and I was undeservedly credited with some benign weather influence—after all, does it not always rain on Londoners? From my own point of view this propitious arrival was slightly two-edged, because in one voice I was required to offer my felicitations upon this damping of the Dust Bowl, expressing hopes for its continuance, while with another I prayed for C.A.V.U. in which to fly.

My problem with the U.S. Air Force's precious six-jet B-47s (RB-47s and B-47Es are now rolling off the production lines) was that they are much too expensive and valuable to be flown without good cause, and flying blind or in bad weather is discouraged, even for company's test pilots and aircraft, in a Southern state that has only a dozen or so duff days in a year.

My flight, in short, had to be a routine acceptance one (of which each aircraft usually does about three before being taken over by the Air Force pilots), and it had to be made in reasonably good weather. Fortunately, the second afternoon provided the need for a suitable test flight and just sufficiently good weather for it to be carried out. In fact, there were a large number of aircraft awaiting test of one kind or another, but most needed clear skies for radar bomb-sight checks against visual observation. The machine in which I flew with a crew of two required a few checks to be carried out following adjustments made in accordance with snags recorded on the squawk-sheet during its first flight. Weather proved better than had been forecast when we reached some fifty miles from base, and we were able to sail up into the clear blue over and remain there for an hour or so.

When the decision to fly came, it came quickly, though late enough to threaten my airline reservation for the same evening (when I was to fly north to the main plant at Seattle). I was practically thrust into lightweight flying suiting, boots, Lombard and mask. I do not know how the M.T. driver found the right aircraft among the many that were closely lined up or clustered on the various hard-standings, aprons and tracks.

B-47s carry an operational crew of three—pilot, co-pilot and navigator/bombardier. The co-pilot also looks after tail gunnery and both pilots do some engineer work. The pilots' seats are in tandem, and low down on the left-hand side is a narrow passage through to the nose. Here a spacious station is provided for the navigator/bombardier, in which he is surrounded by the instruments of his trades. His seat revolves "piedually" and has powered elevation control. It is also an ejector seat (or should it be "rejector" seat?) as it fires downward through a hatch. Both pilots' seats eject normally, and the rear or co-pilot's seat can be turned round—somewhat complicatedly—to allow him to examine the rear turret radar and associated gubbins.

To return now to the nose, because that is where I started the

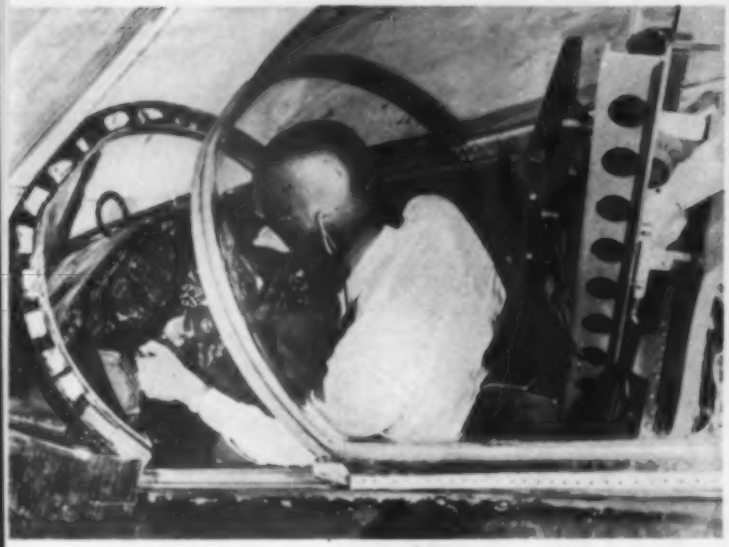
BOEING B-47E In the Air . . .

flight, reference must be made to the periscope provided. The navigator's station does have windows, but in the bomber version none faces forward, as seen in the photograph on p. 243. Instead, a binocular-like instrument is apparent ahead of the seat and through its optical system, adjustable in pitch, yaw and magnification, can be seen all that is ahead, to the side or below, through wide arcs.

When I now say that the account which follows will be a rather emasculated version of in-the-air handling notes, I imply no personal squawk, though naturally I would like to have been able to do more. Ideally, the minimum requirement for writing notes of this kind is a flight of at least one hour on one day, a night to think about it, and sleep on the experience, and then a second flight.

In the two-man Boeing crew, the navigator/bombardier was also a qualified co-pilot and had work to do; take-off and landing are preferably two-man operations. Thus I was no more than a keenly observant passenger in the nose at these times, and no first-hand account of the procedures can be included.

Although it is 6½ years since the prototype first flew, the B-47 remains a unique and startling design. What other aircraft has a



(Above) Even with the aid of telescopic steps it is a long stretch into the B-47 crew compartment. The co-pilot/observer is encouraging the author to embark, while the captain looks on. (Upper left) The front cockpit might well be that of a large fighter. Spectacle controls are provided and, of course, ejector seats. (Lower left) The man in the nose has a swivelling seat to enable him to attend to all the navigational and bombing equipment with which he is surrounded. Here are seen duplicate flight instruments, parts of the K bombing system, including the viewer, and, to the right, the binocular periscope sight with its controls underneath. This seat ejects downwards. (Below) A pleasing portrait which accentuates the fine lines—this is an RB-47E—without allowing the sharply swept wings to steal the show.

normal wing-tip deflection of 61in between ground and flight position, and can accept 14ft between up and down limits without damage? To all but those who build it and operate it the B-47 has always been something of an unknown quantity. For me, a few of the unknowns have now been revealed.

The control surfaces are all powered hydraulically and feel is artificially provided with the aid of torsion springs in the case of the ailerons and ram air and springs for the tail surfaces. Alternative cable operation permits the aircraft to be flown safely in the event of power failure. The tailplane is of the fixed type, and all the flying control surfaces are of conventional configuration. They are internally balanced by pressure sealing and balance chambers.

Flap operation is also tied in with a trim tab on the left elevator to look after trim change with flap movement. Flap must be used for take-off, so a horn is included among the circuits to warn the pilot should he open up for take-off without first lowering the flaps.

Ground manœuvring is facilitated by the steerable front bogie of the bicycle landing-gear. This has two hydraulic power control settings, one for taxying which allows 60 deg angular movement left or right, the other for take-off and landing which gives only 6 deg left or right. For towing, the same control can be set to free the front bogie altogether.

The rear bogie is fixed and the outriggers are free-castoring over a range of 28 deg in and 93 deg out. This arrangement makes for excellent control on the ground and gives a 180ft turning circle. The aircraft rolls slightly during sharp turns on the ground. The pilot uses only his rudder pedals. Four brake drums are provided for the two wheels of the front bogie and two drums are provided for the two aft wheels. They are of non-skid type, developed by Boeing and now built under licence by Hydro-Aire Inc. The purpose is to improve ground stability during braking.

There is a close similarity between the instrument and control layout in the two cockpits, and it says a lot for the simple arrangement, clear labelling and good design of the equipment that without briefing I was able to move into the rear cockpit in flight and find the things I wanted. It is a distinct advantage, of course, to have about as much room as there is in the Canberra cockpit devoted to only one pilot and his requirements. The view from the bubble enclosure is superb, and to be able to gaze back and down the great swept flexing wing with its jutting pods is a memorable experience. The turn-up of the outer portion of the wing is clearly apparent in flight, as is the droop on the ground.

A detailed description of instruments and equipment must await another occasion, as must other details of this remarkable bomber.

I have seldom come across an aircraft in which so much attention has been paid to the convenience and comfort (especially in the mental sense) of the crew. All kinds of devices are provided to make the usual actions simple, effortless and foolproof. And, so far as I could judge, this has not led to over-complication or to the probability of minor unserviceabilities. The detail design-work appeared to be excellent.

A portrait which contrasts with that below in bringing out the high-aspect-ratio, sharply swept wings and protruding pods which characterize the aircraft.

The ejector-seat operation was explained to me in detail. For front seat and rear pilot's seat the procedure is quite different, but both are fully automatic once the necessary short sequences of actions have been carried out. I was unable to find much justification for the fiddling and complicated automatic release clip on the pilot's harness, but that is a trivial matter. The operation of the seat height and angle—for some reason these cannot be altered separately—and of the rudder reach, are good enough, and the quick disengagement of the rear column and wheel is very well planned. This helps the rear-cockpit pilot a good deal in moving about the aircraft, in turning to face aft, or in getting out in a hurry.

The flight in the B-47 was my first real experience of a high-speed swept-wing aircraft. The sweep angle is basically 35 deg and the span is 116ft and, incidentally, the tapered skin of the central box which is the core of the wing is ½in thick at the root and tapers off to 3/16in at the tip. From the flying point of view the

This picture is included to show the up-sweep of the wing-tips in flight, and particularly the vortex generators. Briefly, these tiny surfaces take energy from the free airstream and transfer it to the boundary layer. The effect is to reduce turbulence and delay the onset of high-speed-stall effects.

BOEING B-47E In the Air . . .

swept wing has some well-known characteristics of which the most apparent is the rolling effect resulting from yaw (i.e. the application of rudder).

Small changes in lateral trim are made with the aid of conventional aileron trim-tabs, but a touch of rudder or rudder trim may be the better way of obtaining correct lateral trim. For the same reason, powerful aileron control and big aileron deflections are called for, and at high angles of attack with flap down the "flaperon" effect has therefore been employed.

The long, flexible wings are the cause of progressively falling aileron effect as speed increases above that for normal cruise. At medium altitudes and with speeds of more than 400 kt the rate of roll is less than 10 deg/sec. A flutter limitation is also placed on the aircraft, but it is important to get these superficially alarming things into perspective. This aircraft is designed to do a specific bombing job as efficiently as possible, and the limitations referred to could only occur outside its normal operating regime. A parallel would be to complain that a racing car was too hard-sprung for slow driving over *pavé*. At its operating speeds and altitudes—and they are both very high—the B-47 has light and adequately effective controls, although it is no good expecting to pull a lot of g in turns when it is making straight for an objective with a full load. The vortex generators on the wing outer and upper surfaces to which reference was made in *Flight* a few weeks ago have helped to delay the onset of buffeting.

At the risk of surpassing even a Hollywood epic with the number of credits and build-ups before getting rolling, I must mention one more aspect of performance—namely, that with engines out. For example, with a take-off weight of 185,000 lb and without water or rockets, the B-47 can lose one engine (and marginally any two) while both flaps and gear are down, and get away with it—in both senses. At the lower weights, such as would obtain when returning from an operational sortie, the aircraft will fly on two engines.

There are two emergency occasions when correct procedure calls for the stopping of four out of six engines. The first is for maximum endurance when holding at the end of a sortie; the second is for an emergency landing with brakes and tail-chute out of action.

In spite of the hurry to get off, a full external check was made by the captain before he entered the aircraft. This took some 20 minutes and followed a complete inspection by ground crew men. Personally, I stopped inspecting after standing up too quickly in a wheel well. Each inspection door—and there are dozens of them—had a tiny putty seal across it with an impression of the individual inspector's identification marks clearly stamped upon it.

The inside check before starting engines was another lengthy business, involving both pilots. Then there were all the pre-taxi checks and, somewhat shorter, the pre-take-off drill.

With the aid of my periscope (provided with power for elevation and traverse when the J47s got turning) I could follow all ground movement very well. I had been unable to detect the actual starting-up of engines either by noise or by feel, but could hear the combined noise very remotely when taxying. I had heard the pilots call for starts on 4, 5 and 6, then 3, 2 and 1; they were using the external intercom plug and talking to "ground." When cleared to taxi we moved down the long line of other B-47Es and RB-47Es, occasionally making surprisingly sharp turns. The brakes when checked were extremely powerful and nearly caused me to get my face wedged in the rubber face-piece of the periscope.

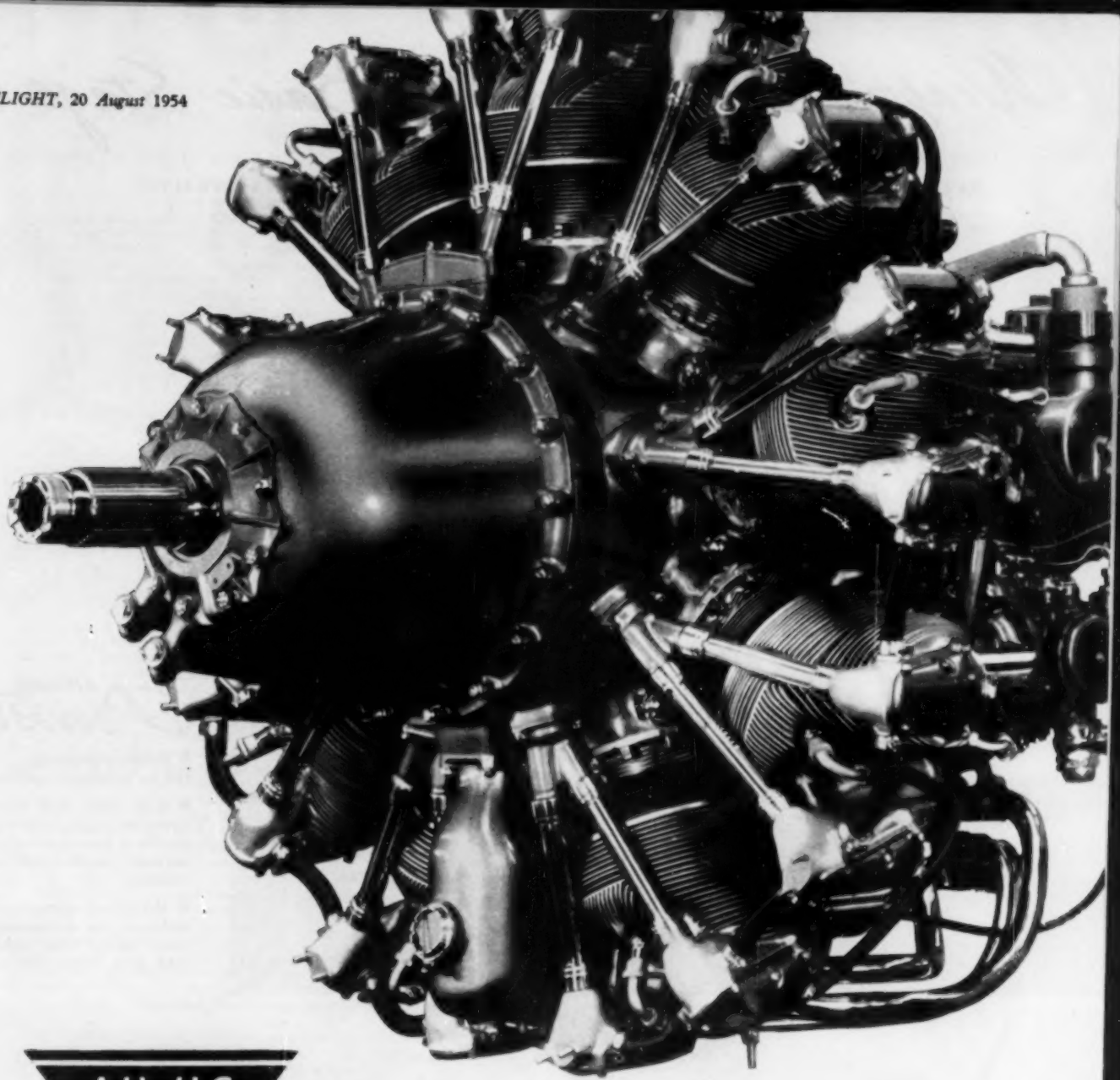
I could hear everything very clearly, thanks to the most perfect intercom I have ever used; it was crystal clear, and completely without background noise or breathing. Each man is provided with an effective volume control. The navigator's microphone switch is a foot-operated press-button which I found very convenient and much preferable to a switch on one's mask.

Moving back from the nose position, one crawls "on edge" along a narrow port-side gangway, and has this worm's-eye view of the pilot and co-pilot in their tandem seats above.

The moment to take off finally arrived, and the engines at full bore could then be heard as a distant mighty rushing noise. Initial acceleration felt negligible; and even when the voice of the second pilot came through, calling the speeds, we did not seem to be moving very fast. He cut in at 80 kt and, with the very smallest nose-up change of attitude, we unstuck smoothly at about 115 kt. Both sets of wheels must have come off the ground almost simultaneously, and they took about ten seconds to lock up.

Without any conscious effort or pronounced nose-up attitude

Looking, Irish-like, at where the internally-stowed take-off assistance rockets are not on the later marks of the B-47. A jettisonable external harness of 33 × 1,000 lb bottles is now employed, and the General Electric J47-GE-23 engines have water/methanol injection (6,500 lb thrust). Seen with the author are (left) Rod Randall, the pilot, who is supervisor of production test flying at Boeing, Wichita, and (right) the co-pilot/observer, Maurice Norum.



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BOEING B-47E In the Air . . .

the B-47 picked up speed and height rapidly and we were soon skimming along level below cloud at about 325 kt. After a while an area of blue sky showed up and the pilot nipped through and picked up 20,000ft in a very short time indeed. Unless my ears were telling lies, pressure hardly kept pace with climb.

Shortly after take-off I was mildly alarmed to see a white cloud of vapour appear from beneath the pilot's panel, and for a few seconds I was blacked-out in mist. I called the pilot who diagnosed condensation, saying that it was quite a common thing in these aircraft and that he should have warned me about it. Generally the ride was smooth, and occasional patches of rough air were transmitted as transverse shudders to the man in the nose—still me at that time. While the first checks were being made I worked on the sight and radar as I had been shown, but had little joy, owing to my inability to set it all up nicely.

The time now came to change places with the co-pilot. This process is not very easy, but, having eased out of the harness of the ejector seat, disconnected oxygen and intercom and unclipped emergency oxygen and the main feed pipe, I crawled aft with my back-chute just missing the various pieces of equipment in the walkway. I finally crawled over the second pilot and wormed up into the rear pilot's position, emerging into bright sunshine and space. In a few minutes I was strapped and variously plugged in. The odd drop of perspiration dripped from my Lombard, but all was fine. As soon as I had engaged the rear wheel I was invited to take over while the co-pilot, now turned navigator/bombardier again, got installed, and warmed and set up his equipment.

What does a man do when he is suddenly put in control of someone else's big, beautiful bomber? Frankly, I grasped the wheel and did nothing but gazed round in awe at the magnificent view, the big shapely enclosure, the wings and their pods. After a while I moved the wheel somewhat gingerly, finding the ailerons pleasantly light, and the elevators a little heavier. I was reminded of the village policeman who once had the job of guarding Mr. Billy Butlin's Consul overnight after it had belly-landed in a field. When joined by the pilot in the morning, he indicated the control wheel and said, "If I pulled yon, would 'er dip a bit?"

I did pull, and then pushed, and 'er did dip a bit, and in fact continued to dip a bit for some seconds until the fuel in the tanks which I had disturbed stopped sloshing about.

The up-sweep towards the tips of the long slender wings can be seen quite clearly from the cockpits and in turbulence the wings flex, as may be plainly observed. This is said to produce a damping effect in rough air and to be conducive to smooth riding.

The impression I gained was that the B-47 responds to controls quite slowly, like a big conventional aircraft, but that the controls themselves are pleasantly light for such a machine. The response to normal aileron movement in particular is positive but slow. The rudder is used more than I had expected, both to "centre the ball" in turns and, as mentioned earlier, in conjunction with the ailerons for lateral control. The controls do not seem to heavy-up appreciably with increasing speed but the time taken to go into a turn is longer.

For a few minutes I flew with elevator-control power off. There was sufficient control for safe flying under those circumstances, but the stick felt very soggy and over-balanced.

So far we had been cruising, and after having made a few medium and fairly steep turns—endeavouring not to let the nose rise or fall too much—I asked permission to open up and see what the first signs of buffet felt like. The height was in the middle twenty-thousands at the time, and I was told that the engines would not object to 98 per cent r.p.m. almost indefinitely. The six throttles are easy to hold in the right hand and they move lightly and smoothly. This is another point which I have previously noticed with American aircraft I have flown—their throttle levers move very nicely, yet there is the hardly detectable friction to hold them at any point. Too many British aircraft—particularly the older ones—have stiff throttles, with back-lash.

Speed built up quickly at first then more slowly, and finally settled down near the limit for no buffet and the limiting speed for the height. To feel the controls and buffet, therefore, I pulled the B-47 round fairly hard in a turn and managed to produce the first trembling I had expected. The man in the nose then came in plaintively on the intercom to ask how he was expected to write with a 4 lb pencil while wearing a 20 lb helmet . . .

I did not stall the aircraft myself, but learned that there is no trick about it. Plenty of warning buffet is given 10 to 12 kt above stalling speed and at the point of stall there is a slight nose-up trim change. Whether the vortex generators have affected the stall I do not know; they are primarily to postpone buffet at high speeds, which also causes a pitch-up tendency. Intentional spins are not permitted but the recovery is reported to be normal. When fully stalled, particularly with flap down, the buffeting is apparently severe and this is the main reason for avoiding it.

During this flying around I had adjusted the tail trimmer from time to time. The scale has marked on it the approximate c.g. position for the condition of flight. It is graduated to suit a Mach number of about 0.75 at cruising altitude. The c.g. moves forward during flight and must be known pretty accurately for approach and landing.

Although I was now begining to get the idea, and there were a lot of things I wanted to try out higher up, at slow speed, with engines out, and with controls intentionally misused, time dictated a return to base. I made the let-down before returning to the nose for the landing. The B-47 has no dive brakes and makes a rapid descent with wheels down and engines cut back to the flight-idling stop. The percentage r.p.m. at this setting vary automatically with atmospheric conditons. The landing gear can be lowered at 305 kt and the let-down made at this speed. Up to 30 per cent of flap can also be lowered if speed is kept below 230 kt.

By the time I had settled back in the navigator's chair we were nearing the airfield. The circuit was made at the normal height of about 1,200ft and the landing checks completed. Flaps were lowered at 220 kt and full flap at 195 kt. Before the turn-in, the approach chute was released at about 1,100ft and it was just possible to detect a gentle tug as it streamed. Its purpose is to permit more power to be used while making a reasonably steep approach, and this in turn helps to give a quicker change in rate of descent at the pilot's discretion. As the wheels are lowered there seems to be a momentary nose-up, then nose-down, pitch-change; but this is scarcely discernible.

After a second check on landing gear the final turn was made at about 150 kt, slowing to the speed called for by a.u.w. for the final approach. The landing was smooth and it was possible to feel the rear bogie touch slightly before the front one. Next the main chute was released and again a gentle pull and more marked braking could be detected. The early part of the run was somewhat rough, but this was probably the runway. (I noticed on several civil airfields also that both taxi tracks and runways were less smooth than their counterparts at home.)

Unfortunately there was little time to discuss the flight with the pilots, so with thanks and a few brief questions I scrambled out of my kit and set out for the new civil airport at Wichita to board the flight for Seattle, birthplace of the B-47 and B-52.

NOTES ON B-47 VARIANTS

Boeing XB-47: Two prototypes, the first flying on December 17th, 1947, and the second on July 21st, 1948.

B-47A: Six J47-GE-11 turbojets of 5,200 lb thrust each. Eighteen built-in solid-propellant a.t.o. rockets. Transparent nose cone, no tail armament. Small production batch, first being completed on March 1st, 1950.

B-47B: Six J47-GE-23 (or PA-25 or ST-25) turbojets of 5,800 lb dry rating. No transparent nose cone. Provision for two 1,780-gal drop tanks. Large number built at Wichita, Tulsa and Marietta. KB-47B tanker has Flight Refuelling or Boeing equipment for high-speed fuel transfer. RB-47B has eight cameras and associated equipment in heated pack which can rapidly be installed in bomb bay. ETB-47B is a dual-control trainer.

XB-47C: One-off experimental modification with four single pods, each housing one Allison J71 turbojet of about 9,700 lb static thrust. Believed not to have flown yet, although installation fully developed for Douglas B-66.

XB-47D: One-off experimental aircraft with inner double pods replaced by large nacelles each housing a single Wright T49 turboprop of some 9,000 s.h.p. driving a single airscrew with wide-chord blades. Not yet flown.

B-47E: Standard production bomber. Twin 20mm remote-control tail barbette, and very extensive detail modification. Nearly 2,000 built at Wichita, Marietta and Tulsa. RB-47E is a specialized photographic aircraft, with an extended nose. Very complete reconnaissance equipment is carried; the aircraft is not convertible for use as a bomber. There are also trainer, tanker and other types of B-47E, and one machine has been fitted with J57 turbojets in the outboard positions, for experimental development.

BOEING B-47E: LEADING DATA

Six General Electric J47-23 or 25 turbojets of 5,800 lb dry (or 6,300 lb wet)

Three-seat bomber with provision for about 20,000 lb internal load and a single tank or container weighing about 15,000 lb under each wing. Span, 116ft; length, 108ft; height, 28ft; max. gross weight, 202,000 lb; max. speed, about 630 m.p.h.

An approach chute first released on the circuit is seen streaming behind the main landing chute just after touch-down.

WORLD PARACHUTING . . . (Continued from page 235)

followed by a precision landing. In this test, 100 points were awarded for correct free fall time, with each fifth of a second plus or minus losing ten points. Two hundred points were awarded for landing in the centre of the ground marker, with one point deducted for each metre away from this point. After this came a pair of descents from 650m with immediate parachute opening and precision landing. These were marked as for the landing part of the first tests. Lastly was a stability test in which the parachutist had to assume a stable position within three seconds of leaving the aircraft, and maintain this position for a further fifteen seconds before opening his parachute precisely at twenty seconds.

The competition proper opened with a bang on the morning of August 3rd, after one day of official practice. After a brilliant display of Stampe aerobatics by Michel Berlin, two French parachutists made long free falls, opening their parachutes tight in against the front rank of spectators and the rippling line of national flags. Pierre Mas, test parachutist, maintained a wonderfully stable position as he fell to within 500ft of the ground before pulling his ripcord. This was real parachuting by a master!

In bright sunshine a procession of aircraft droned their way to St. Yan, carrying parachutists from France, Russia, Yugoslavia, and Czechoslovakia. Italy's Fairchild Argus and the British Rapide—which also carried Fred Mason, sole American representative—were punctuation marks in a constantly wheeling circus of "Stampes."

From the outset, there was no doubt that Russia would come out on top. With first-rate equipment and even better training they seemed immediately to lock on to the centre of the target and to sail in—often against the wind—"playing their parachutes like harps," as one of the British team said in horrified amazement. The Czechs, using the same equipment and training were right behind them, and for the rest—with the exception of Sam Chasak of France—the competition was a procession. Fred Mason, who on the practice day had jumped from a Stampe with a French parachute and landed outside the airfield on the far side of the river, made two goods jumps from the Rapide. On the previous practice jump he reported that he had "clobbered in so hard I darned near busted my butt!" This expression is expected to become popular at No. 1 Parachute Training School!

The wind was tricky for the first two delayed drops, and although John Beadle, "figure man," did his best with the Met. information available, the team experienced considerable difficulty in getting on to the target. They did, however, manage to group round it in a way that was very commendable in view of their lack of practice (no more than two 20 second jumps apiece!).

After a very difficult final team selection, Card and Sutton had now been placed in reserve. Regardless of this great disappointment they took on a lion's share of the ground work. Parachutists, regardless of nationality, were relieved of their parachutes by these enthusiasts almost before their feet had touched the ground.

During the two jumps which were marked for landing precision and time of free fall, the British team also practised the stabilized position in preparation for the last part of the competition. Having tapped each man smartly on the shoulder as a signal to leave, I had plenty of time to watch their cool determination as, eyes on their stop watches, they fought for twenty seconds to remain in the classic swallow-diving attitude. In some cases their efforts were met with complete success.

During this first day, the Italian Riccitelli broke a leg on landing and Yugoslavs Martinovic and Milicevic were slightly injured. Koubec of Czechoslovakia had a main parachute failure at the end of his 20 second delay, and opened his reserve chute at 23 seconds. His main parachute then decided to open, and Koubec completed his descent beneath two canopies.

At the end of the first pair of jumps, which were added and divided by two for a single result, Fetchichine and Marutkine of Russia led with 282 and 246, while Sam Chasak of France dropped into third place with 207. Monique Laroche, Champion of France, did well with the time test, but had trouble in steering her parachute on to the target. It is surprising that one so charming and petite is able to find even part of the great strength required for continual manipulation of a large canopy. Hoffman scored 185 out of 200 for the timing section of these jumps, but dropped points on the landings.

On the second day, the wind died and the competitors really started to close on the target. The British team dropped at a round figure of 2,000ft, and to comply with the rules, all parachutes had to start deploying within three seconds from the time of jumping. Russia again scored heavily when Fetchichine returned 4.47 m and 5.85 m for his two jumps. His team mate Kosinov followed with 8.37 m and 17.62 m. The results of the Russian team's year of intensive training were apparent!

On the third and last day of the competition, the British team took wing, determined to fight the losing battle to the end. Cries of "This one for Good Queen Bess," were heard over the aircraft intercom as the boys stepped over the side at 5,000ft. "Tommee" Moloney, having sat at the door cracking jokes during the climb aloft, eased his compact body out into the airstream, and left the port wing in one of the most beautiful dives ever seen at St. Yan—or elsewhere. I sent a silent good luck wish after him as his spreadeagled form dwindled towards the sun-dried grass—steady as a diving hawk until his parachute blossomed far below, 19.4 seconds away from the empty door of the faithful Rapide.

"Tommee" scored 100/100 for his position in flight, and this, with his timing, gave him a total of 170/200 for the test. It gave the rest of us a quick glance into the future of sporting parachuting in Britain.

"Timber" Wood, dropping only a few minutes before the first rain of the week, ended the competition. There only remained the closing ceremony before the boys were dispatched by bus for a wonderful dinner given by the Aero Club of Vichy.

The organizers of the Second World Parachuting Championship did a fine job in every possible way, and I think many of us were sorry to see them defeated on their own ground.

One question remains to puzzle me. Who was the intrepid parachutist who, in a private closing ceremony of his own when all the birdmen had returned to their nests, jumped downwind of the field and executed a perfect two-parachute landing in the local graveyard?

INDIVIDUAL PLACINGS

Place	Name	Team	Points	Place	Name	Team	Points
1	Fetchichine	U.S.S.R.	672	17	Moloney	Britain	400.5
2	Marutkine	U.S.S.R.	610.5	18	Harrison	Britain	388.5
3	Chasek	France	582.5	19	Mlle. Laroche	France	383.5
4	Kosinov	U.S.S.R.	579	20	Prentic	Yugoslavia	351
5	Milicevic	Yugoslavia	551	21	Mason	U.S.A.	348.5
6	Jehlicka	Czechoslovakia	550	22	Boschi	Italy	339
7	Krivan	Czechoslovakia	534.5	23	Hay	Britain	303
8	Damjanovic	Yugoslavia	527	24	Hoffman	Britain	302
9	Mlle. Seliverstova	U.S.S.R.	522	25	Martinovic	Yugoslavia	288
10	Kaplan	Czechoslovakia	514	26	Wood	Britain	241.5
11	Neimartk	U.S.S.R.	512	27	Milani	Italy	187
12	Hotek	Czechoslovakia	504	28	Rinaldi	Italy	175
13	Lard	France	453	29	Persevalli	Italy	159.5
14	Mas	France	451.5	30	Polican*	Yugoslavia	87.5
15	Koubec	Czechoslovakia	434.5	31	Riccitelli*	Italy	—
16	Cledassou	France	413.5				

* Injured first day.

FOR THE BOOKSHELF

"Return from Hell," by Jules Roy, D.F.C., Légion d'Honneur. William Kimber and Co., Ltd., 46 Wilton Place, London, S.W.1. Illustrated. Price 15s.

THE reader familiar with Jules Roy's earlier book *The Happy Valley* (V. Gollancz, 12s 6d), will know what to expect in *Return from Hell*. It is equally introspective; and gives every bit as dramatic and realistic a picture of what it meant to fly over Germany and France 37 times in a Halifax of Bomber Command in the last year of the war against Hitler. Yet, interwoven with the fear and tragedy are passages of sheer beauty and delight that could have come only from the pen of a Frenchman who loved England and life even more deeply because both were in peril.

The reason that only French airmen of World War II produce this kind of book is probably that they were older than their Allies or their enemies. Their average age of 30 compared with an average of 22 for British aircrew, and many were married. Their more mature outlook helped them to understand the boisterous actions of their younger allies, even when they did not join in them, as Jules Roy shows in one reference to a U.S.A.A.F. bombing raid. "Twenty-four Liberators from this base went today to bomb Saarbrucken," he recorded on September 7th, 1944. "They took off in formation and formed into squadrons to make a close-set stream of a hundred planes. Of the nineteen that returned, twelve were hit by flak. Four were shot down by rockets. That perhaps explains why the Americans laugh so loudly and bang the doors in the middle of the night when they leave the canteen, with no respect for their neighbours."

But there is beauty in *Return from Hell*, as well as the grimness of war. Jules Roy suddenly awakens to the secret of the English summer which "begins in August and only lasts a few days, but gives generously everything which in France is spread out over three or four months. The country dispenses so many miracles at once that one suffocates with happiness, and the beautiful houses seem to harbour only peaceful loves."

Above all, this is the diary of a man who returned from the hell of a wartime tour of duty with Bomber Command. A man who was brushed by death in his first mission, when his Halifax collided with another, and who, at the end of his service, had to run the gauntlet of the German intruder fighters that wrought such havoc over our airfields in March 1945. "But no victory is easy, and were it so it would have no savour."

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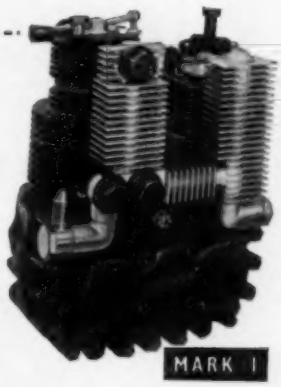
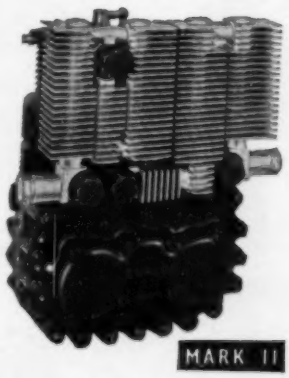


MARK I

MARK II

Developed to meet the heavier needs of multi-jet aircraft. It is particularly suitable for gas turbine starters and has an increased performance at higher altitudes.



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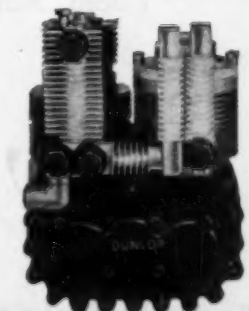

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	Working Pressure p.s.i.	r.p.m. (cruising)	Nominal Delivery cu-ft/min Free Air	Boost Pressure p.s.i.
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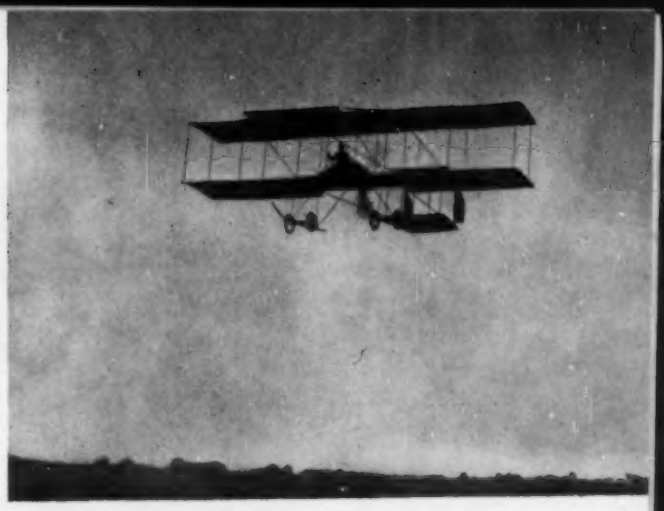
BRITISH EUROPEAN AIRWAYS

WOMEN in AVIATION

It Started in 1783 . . .

By PATRICIA STROUD



Mrs. Maurice Hewlett flying a Farman biplane. She taught her son to fly at Brooklands, after which he joined the Royal Naval Air Service.

IT is still considered, even in 1954, a matter of some moment for a woman to be closely concerned with aviation. I know only too well the astonishment which is aroused when I present myself at a Royal Air Force station and indicate that, as a journalist, I am prepared to fly in a military aircraft, to say nothing of the difficulty of the initial negotiations necessary towards such an operation. A woman can, without causing comment, have herself conveyed from place to place in an airliner but as soon as she achieves some professional status in aviation she is likely to find herself as highlighted and exposed as an actress visiting a meat market; and she must have a sturdy spirit to overcome the prejudice which still assumes that the air is man's domain. If she insists, she must be prepared either to don a pair of blue stockings or to become an air hostess to get away with it.

The odd thing is that it was not always so, nor is it true that women have only recently gone into the air. Aviation history records that on November 21st, 1783, the first aerial voyage was made by those two exquisites Pilâtre de Rozier and the Marquis d'Arlandes, who ascended in a Montgolfier balloon from the ever-romantic Bois de Boulogne; and only six months later, repeat six months, a lady of Lyons named Madame Thible made the first flight by a woman in a "free" balloon. In the years that followed, ballooning became a popular spectacle in which women played a considerable and (to judge from old prints and drawings) decorative rôle.

It was at this time, too, that women's skill was first employed in aviation industry, for in 1795 they engaged in the manufacture of the earliest military balloons, presumably so that their betters could fully occupy themselves in their favourite pursuit.

The 1800s gave us the first professional women aeronauts—Madame Blanchard, the balloonist, and Elisa Garnerin, the first parachutist. Mme. Blanchard's career took her over most of Europe in a glittering succession of ascents amidst showers of golden rain and ended with the appropriate flourish of a big blaze kindled by one of her own fireworks. Elisa Garnerin, the "*Venus Aerostatique*," made many parachute jumps—early prelude to those of all the women who courageously dropped to the moonlit fields of France in the last war.

While on the subject of ballooning it is fitting to mention the birth of the Aero Club of the United Kingdom. It is recorded that its conception took place in the basket of a balloon somewhere between the Crystal Palace and Sidcup; it was the brain child of Miss Vera Hedges Butler, a passenger on the flight. When the aeronauts came down to earth the gentlemen of the party took themselves off to Somerset House to register the name of the infant. It is curious thereafter to discover that the name of Miss Butler does not appear among those of the organizing committee, although she was magnanimously permitted to become a member along with several other ladies. I think it is true to say that even today women are tolerated (though not encouraged) to take part in the Club's activities.

Now, wiping that wry smile off our faces, we will turn to the birth of the powered aeroplane. The first powered, controlled, heavier-than-air machine flew on December 17th, 1903, but it was not until 1908 that even a male passenger managed to be taken for a ride; then, three months later, Mme. Thérèse Peltier went

(Right) Mme. Farman standing behind her husband, M. Maurice Farman, in one of his early pusher biplanes. (Below, left to right) Baroness Schenk, who was one of the women pilots flying at Hendon in 1912. Mrs. Stocks, who took part in "ladies' day" at Hendon on July 8th, 1912. Miss Dorothy Prentice, who was not only a flying pupil at the W.H. Ewen School at Hendon in 1912, but was also an aircraft mechanic.

(Left to right) Miss Harriet Quimby, an early American pilot; she was the first woman to fly solo across the English Channel when she piloted a Gnôme-engined Bleriot from Dover to a point near Boulogne in April, 1912. Baroness Raymonde de Laroche—the first woman to obtain her pilot's licence. She made her first solo in October, 1909, and received her brevet on March 8th, 1910. Mlle. Hélène Boucher, who set up many records in a Caudron Rafale before she was killed flying that aeroplane in November, 1934.

WOMEN IN AVIATION . . .

up in the air as a passenger at Milan and subsequently began training as a pilot. The first woman to receive a pilot's licence, however, was Baroness Raymonde de Laroche, who was accorded her Brevet No. 36 on March 8th, 1910, the same day as that on which Aviator's Certificate No. 1 was issued to J. T. C. Moore Brabazon (now Lord Brabazon of Tara).

Until the outbreak of World War 1, many women—particularly in France and Britain—took their licences; in our own country, in 1910, Mrs. Maurice Hewlett, along with the Frenchman Gustav Blondeau, opened a school of flying at Brooklands and there Mrs. Hewlett taught her son to fly. Later she opened an aircraft factory which produced, among other types, some of the B.E.s used at the beginning of the war.

More recently we find in the production sphere Mrs. "Blossom" Miles, a designer in the company which produced the dainty aircraft which still give a good account of themselves at race meetings; and Mrs. Walter H. Beech, president of the Beech Aircraft Corporation of Kansas, U.S.A., which produces trainers, transports and tourers (is it not possible that a woman's touch can be detected in the flourish of the butterfly tail of the Bonanza?)

In the hectic years between the wars women took to the air once more; they looped the loop and performed aerobatics and, having found their wings again, proceeded to extend their vision and their range on flights of long distance and endurance and oceans and records fell beneath them.

In 1921 Adrienne Bolland crossed the Andes in the little open Caudron whose lovely scalloped wings moved above the crowds at the 1953 Paris Aero Show. In 1928 Amelia Earhart was the first woman passenger to cross the North Atlantic, a claim to fame which must seem curious to those who now regard that ocean as an obstacle only a comfortable berth, a couple of good meals and a few drinks in the bar are needed to surmount. Nevertheless Miss Earhart won crisper laurels when she flew solo in her single-engined Lockheed Vega from Newfoundland to Ireland, a challenge few would accept today, and then added the Pacific Ocean to her achievements.

Maryse Hilsz, in 1930, took a Gipsy Moth alone from Paris to Saigon and three years later flew a Farman 291 from Paris to Tokyo and back and then broke her own record over the same route in a Breguet 27. Again in 1930 our own Amy Johnson chalked up a score for women by flying alone in her Gipsy Moth from England to Australia—a performance which she followed by other flights, either alone or in company with others—and ultimately took the London - Cape Town record from Tommy Rose.

In 1934 Hélène Boucher won speed record after speed record until she was champion of the world.

The South Atlantic was flown solo in 1935 by Jean Batten, who in the following year flew from London to Auckland and then, in 1937, beat the Australia - England record. Lady Heath and Lady Bailey chose the Africa route for their exploits, the former making the first of any solo flights from Cape Town to London and the latter making the first solo flight by a woman from London to Cape Town and back.

These, of course, were only some of the stars in the sky; but there were many others who flew great distances alone or who tagged along with husbands and friends who were themselves sometimes flying for fun or surveying routes for the airlines.

The war years gave women a chance to edge their way into aviation in a less spectacular but perhaps even more worthy manner. Those who knew how to fly joined the Air Transport Auxiliary and became ferry pilots, sometimes causing consternation in the Air Force by turning up as drivers of four-engined bombers or delivering fast fighters to their stations. Some became mechanics and radio technicians and proved themselves well able

(Left to right) Miss Amy Johnson, later Mrs. Mollison, who, in 1930, made the first woman's solo flight from England to Australia in her Gipsy Moth "Jason." Amelia Earhart, who, as a passenger in 1928, was the first woman to fly the North Atlantic. Later she crossed solo in a Lockheed Vega. Jean Batten with the trophy presented to her by the Brazilian Air Force in recognition of her solo flight across the South Atlantic. Jacqueline Cochrane, the first woman to fly supersonically.

(Left to right) Jacqueline Auriol was the second woman to fly at supersonic speed when she exceeded Mach 1 while flying a Dassault Mystère. Mlle. Valerie André, who is a combination of helicopter pilot, parachutist, surgeon and nurse. She was working for some time with the French forces in Indo-China. White-sharkskin-clad Violet Ooi is a Qantas Empire Airways receptionist in Singapore.

to withstand the rough and tumble of hangar life; others became draughtswomen and fitters and inspectors in the aircraft factories; the very brave leapt to fame through the hatches to land close to the claws of the enemy in the occupied countries; even those who waited with the children in some dreary lodging outside the air force stations can be said to have played some part in aviation.

With the end of the war a star rose into the sky once more in the form of the air hostess although she was, in fact, born as long ago as 1930, when Boeing Air Transport introduced Miss Ellen Church of Iowa on to its airline. The air hostess must be the woman of the air to have loomed largest in the imagination of the public; and more nonsense has been talked and written about her than either she or we can comfortably stomach.

The old rhyme "And when she was good she was very, very good—but when she was bad she was horrid" is a very apt description of this woman who has become the ornament of the aviation profession. The glamour which surrounds her quite obscures the fact that her work is extremely arduous. It is when in her hands that the passenger

Millions of hours flying are being accumulated every year by women of most nationalities as air hostesses, stewardesses or cabin attendants as they are variously termed; this S.A.S. girl is typical of many engaged in this work.

makes his final judgment of the airline; her reward is a contented passenger and a repeat booking for her company, the first of which she can see before her and of the latter we can only hope she is informed by her superiors.

The air hostess is envied for her experience of the outside world, although her only sight of the Eternal City may be a flash from a bus occasioned by an enforced night stop due to an unexpected engine change; and she can see very little of Siam while serving thirty-seven suppers. Any advantages which do come her way are paid for by having to accustom herself to a most unstable existence, and not only from clear-air gusts.

Nevertheless, women of all nationalities have taken up this profession; the Indian girl whose mother never emerged from purdah, the Chinese girl who might have been expected to spend her days in the Court of the Flushed Begonia, as well as the smart girl from Little Rock, Ark; there they all are cheerfully serving cakes and ale from Albuquerque to Zanzibar.

There are more down-to-earth jobs done by women in the air; parachutists, nurses on ambulance flights, women who record instrument readings on test flights, women like the one who used to sit in the most exposed position in the belly of a Flight Refuelling Lancaster and attach the hose to the line of the receiving aircraft; there are women pilots training members of the Women's Junior Air Corps; and there is Monique Randall, who takes potential air travellers round and round the Marble Arch every week-end in the summer from London Airport.

No space has been given here to women's part in military aviation but mention must be made of the first woman to gain Royal Air Force wings. She was P/O. Jean Bird who achieved this distinction on September 20th, 1952. P/O. Bird has flown over 3,000 hr on more than 90 types of aircraft including fighters and multi-engined bombers, she also holds a senior commercial pilot's licence, and holds the highest form of R.A.F. instrument rating. The second woman to receive R.A.F. wings was Mrs. "Benny" Willis who took a course at Feltwell and passed out ninth from a total of 20. Mrs. Willis and her husband became the only man and wife commissioned in the R.A.F. Reserve.

In this year's King's Cup race Miss Freydis Leaf came fourth and won the Air League Challenge Cup, she is at present leading the National Air Race Championships for this year. It is worth mentioning that the only airworthy Cirrus Moth is entrusted to Hilary Bowman of D.H.'s public relations department.

On the ground itself there are the airline traffic girls, radar operators, women in the control towers, even women aviation writers; and, in spite of current difficulties, financial and restrictive, there are women as well as men who still persist in learning to fly.

Lastly, just in case our male readers are still unconvinced, we can modestly point out that we, too, have broken through the wall of sound. Only the V.T.O.s and the planets wait and, whether man likes it or not, they will not wait in vain.

R.A.F. "AT HOME" NEXT MONTH

THIS year, fifty-eight R.A F. Stations will be "at home" to the public on the Saturday (September 18th) of Battle of Britain week. It will be the fourteenth anniversary of the Battle of Britain and the tenth year in which "at homes" have been held. Last year there was a record attendance of 1,149,000 people and, although fewer stations will be open this year, the R.A.F. hopes for a comparable number of visitors.

Admission to stations is free, but proceeds from car parks, programme sales and so forth will go to R.A.F. charities, which last year received £24,389—some £3,500 more than the previous highest figure.

Flying displays, ground demonstrations and static exhibitions are to be held at the majority of stations; and, to ensure the greatest possible variety in programmes and exhibits, the various Commands will interchange different types of aircraft and equipment. Eleven stations not open in 1953 will welcome visitors this year, and these are indicated by an asterisk in the list below:—

Berkshire: Abingdon. *Buckinghamshire:* Halton. *Cambridgeshire:* Waterbeach.* *Cheshire:* Hawarden; Hooton Park. *Cornwall:* St. Mawgan. *Devon:* Chivenor. *Durham:* Middleton St. George.* *Essex:* Debden. *Gloucestershire:* Filton; Little Rissington; Aston Down. *Hampshire:* Andover; Odiham;* Thorney Island. *Huntingdon:* Upwood.* *Kent:* Biggin Hill; West Malling. *Lancashire:* Kirkham. *Lincolnshire:* Binbrook; Hemswell; Scampton. *Middlesex:* Hendon. *Norfolk:* Horsham St. Faith; Marham. *Northumberland:* Ouston. *Nottinghamshire:* Newton. *Oxfordshire:* Benson. *Shropshire:* Ternhill; Shawbury; Bridgnorth. *Somerset:* Merryfield. *Staffordshire:* Cosford. *Suffolk:* Wattisham. *Surrey:* Headley Court. *Sussex:* Tangmere. *Warwickshire:* Castle Bromwich. *Wiltshire:* Colerne. *Yorkshire:* Catterick; Church Fenton;* Dishforth; Driffield;* Leeming;* Lindholme;* Linton-on-Ouse; Thornaby; Norton. *Isle of Man:* Jurby.* *Scotland:* Bishopbriggs;* Dumfries; Dyce; Leuchars; Turnhouse; West Freugh. *Wales:* Pembrey; Pembroke Dock;* St. Athan. *Northern Ireland:* Aldergrove.

* Not open last year.

AUTOMATIC CONTROL

—and Indication of Turbojet Performance : Some New American Systems

THE use of self-contained control systems for the operation of turbojets in modern high-speed aircraft is an important subject about which little is heard in this country. It may be true that on British aircraft a joint "tailor-made" effort by two or more firms appears to be normal practice; but even in America, where mass-produced and self-contained systems are almost invariably used, there has been little public discussion of up-to-date equipment.

Details have recently been released, however, of some control and indicator systems made by the Aeronautical Division of the Minneapolis-Honeywell Regulator Company, of Minneapolis, Minnesota, U.S.A. This firm has been responsible for the mass production of a comprehensive range of autopilots, other gyro instruments, and flight and engine control systems, including an extremely robust and sensitive integrating gyro for guided missiles and a special autopilot for helicopter use. We print below brief descriptions of five of the new systems and instruments, which are typical of modern American practice in this field.

Electronic Co-ordinated Control System. The increasing complexity of turbojets demands close co-ordination between the power section, compressor bleeds, variable-inlet guide vanes and variable-area jet nozzle during both normal and afterburning operation. The integration of these functions into a single control system is economically desirable (from the standpoint of development costs and serviceability) and permits engineering design for optimum performance.

The Minneapolis-Honeywell fuel-flow and jet-nozzle-area control is basically an electrical system. The engine outputs are sensed and converted into electrical signals which are fed into computing networks, where they are compared with the "called-for" values. When the sensed output deviates from the called-for output, an electrical error signal is fed into an electrical-hydraulic actuator which adjusts the engine input to eliminate the sensed error.

Emergency control requirements have had a significant influence on the evolution of the system. The need for the emergency control to be compensated for variations in engine inlet conditions dictated that the bias mechanisms, which adjust the control with reference to these variations, be located in the hydraulic-mechanical portion of the equipment. The emergency system gives the pilot full power-lever quadrant operation regardless of inlet conditions, and enables him to modulate the engine from idling to full non-afterburning thrust, provided he takes care not to over-accelerate the engine below the 90 per cent speed point (normally equivalent to a 40 to 50 per cent thrust point).

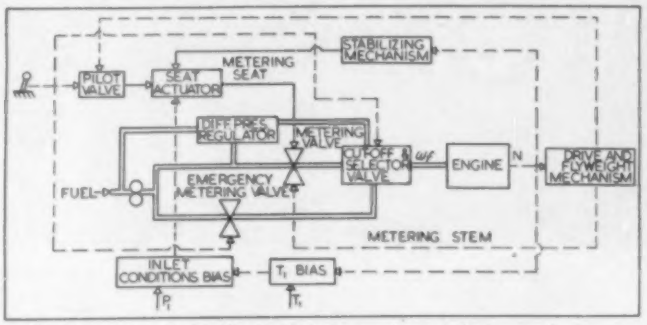
The weight of the entire system is in the region of 75 lb. The hydraulic system in the control can be designed to handle up to 40,000 lb of fuel per hour in the primary system, and 70,000 lb per hour in the afterburner system.

Hydro-Mechanical Fuel Control. This unit, a block diagram of which is here reproduced, is designed to provide automatic fuel-control operation for fixed area, single-spool turbojet engines of small and medium size (up to 2,500 lb thrust). The control operates at any altitude up to 60,000ft, at ram ratios of up to 1.8: with minor modifications it can be adapted to turboprop, free-turbine, and certain air-bleed turbine engines. A main advantage is that no external source of electrical, pneumatic or hydraulic power is required: fuel accomplishes all control functions, by means of the one small unit (weighing 8½ lb).

The governing system is of the integral-plus-acceleration feedback type, giving proper response while maintaining stability and isochronous governing. Acceleration and deceleration fuel-flow limits are automatically controlled as a function of engine speed, compressor inlet temperature and compressor inlet pressure. In the event of a failure of the main system, an emergency metering valve can be used to control fuel-flow, selection of the emergency regime being manual by means of a valve which also cuts off the fuel on engine shut-down.

Mechanical-hydraulic Speed Sensor. In the field of automatic controls, one of the most widely used parameters is speed of revolution. Minneapolis-Honeywell has developed and built speed-sensor units, to sense speed and convert it to a usable signal.

The pressure-output speed sensor is the basic unit of this group. It operates as a force-balance system between the hydraulic and mechanical forces, balance occurring at the regulating valve. Here the hydraulic force tends to open the valve and the mechanical forces generated by the rotating flyweight system tend to close it. Thus if the hydraulic fluid flow to the unit is restricted by an orifice at the speed-sensor inlet, the pressure differential between the sensor outlet and the by-pass pressure is proportional to the centrifugal force of the flyweight, and therefore to the square of the input r.p.m.



Block diagram of the Honeywell hydro-mechanical fuel control.

A second variation uses the pressure differential to move a piston and rod, so producing a linear motion proportional to the square of the input r.p.m. By means of adjustable cams on the rod, this axial motion may be used to actuate one or more micro-switches placed radially around the rod. This axial motion may also be used to actuate a servo-valve, variable-needle valve, or other type of mechanism required to operate on an r.p.m. parameter.

A third variation consolidates the functions of the first two speed-sensors and converts the axial motion of the rod, through a spring-loaded cam, into rotary motion to drive a potentiometer wiper. By contouring the cam and/or potentiometer, an output e.m.f. proportional to speed or any other function of input r.p.m. can be obtained. All three types of the device, it is stated, are well suited to jet-engine control applications, providing signals capable of integration in any type of control system.

Exhaust Gas Temperature Indication System. The precise indication of jet-pipe temperature is an obvious and essential operational requirement in any turbojet-powered aircraft. This Honeywell unit is electronic in operation, and has a 1,000-hour life without re-calibration. Consisting of only two components—power unit and indicator—it is designed to give an indication of temperature from 200 deg C to 1,000 deg C with better than plus or minus 5 per cent accuracy.

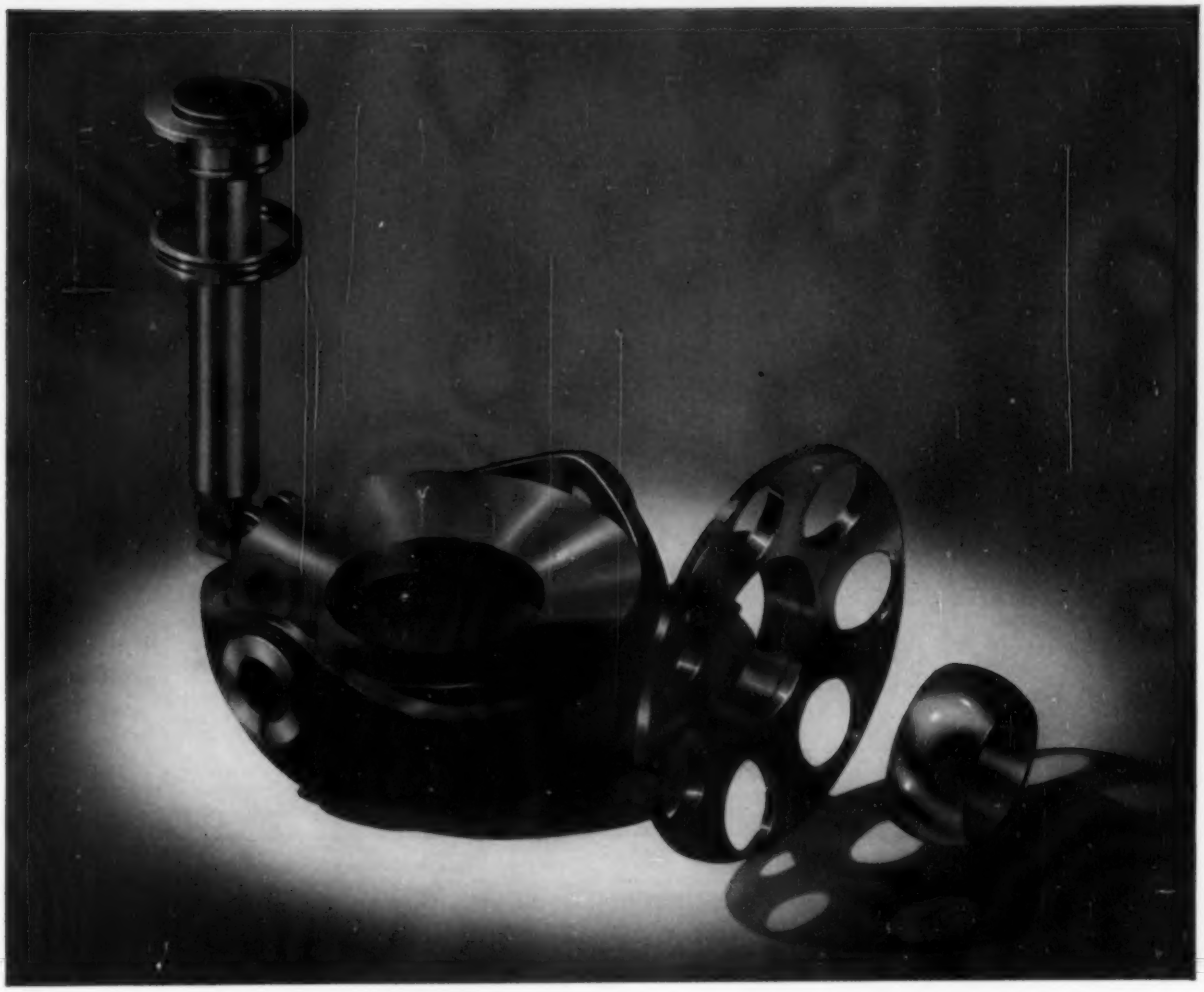
The input signal to the system comes from a thermocouple harness, supplied by the engine manufacturer and utilizing multiple chromel-alumel thermocouples connected in parallel. This is a null-type method, in which the thermocouple signal is compared with the indicator-position signal on the indicator balance potentiometer. The resulting difference signal is amplified to drive the indicator to balance.

The power unit is so designed that the amplifier and calibrator components are grouped in separate sections, each of which can be readily changed when adapting to new requirements. The calibrator section, in which calibration of the bridge voltage and indicator dial is performed, houses the thermocouple cold-junction compensator, the thermocouple bridge and all calibration adjustments. Compensation for the chromel-alumel cold junction is made over the range −65 to +165 deg F.

Pressure-ratio Indicator System. This enables the pilot to adjust his power settings to obtain the most economical performance from his aircraft during cruise. The same technique can also be used to adjust accurately the settings for take-off thrust. The system compares engine inlet pressure and jet-pipe pressure, and indicates the ratio between the two. Power settings can thus be adjusted to give the appropriate pressure ratio for optimum engine performance.

The M-H equipment incorporates a force-balancing unit, a modified form of the mechanisms used in the company's altitude and Mach sensors. It consists of two components: a shock-mounted sensor-transmitter and the pilot's indicator.

The sensor converts the two input pressures into forces by means of bellows. The forces are resolved mechanically so that the follow-up motor rotates proportionally to the ratio of the two pressures and rebalances the forces. The pick-off signal, produced by a pressure change, is amplified and powers the follow-up motor which drives the rebalance mechanism to provide a null-seeking loop. The rotation of the follow-up motor is connected to the transmitter synchro which directly drives the indicator. Weight of the complete system is approximately 3.6 lb.



These components for the range of pumps designed and manufactured by us are of extreme dimensional accuracy and super finish, and are the operative parts in varying the delivery of self-governing, 2,000 p.s.i., fuel pumps. Three basic pumps cover present engine requirements with deliveries of 460 to 2,800 gallons per hour.

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

LUCAS

JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD., BIRMINGHAM & BURNLEY

Lucas-Rotax (Australia) Pty. Ltd., Nepean Highway, Cheltenham S 22, Victoria, Australia.
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ARMSTRONG-SIDDELEY

RECOMMEND WAKEFIELD Castrol MOTOR OIL THE MASTERPIECE IN OILS

FOR THE *Sapphire*

CIVIL AVIATION

IN CAPITAL COLOURS: The Viscount 700 prototype, G-AMAV, is pictured airborne in the attractive red, white and silver colour-scheme of Capital Airlines. The markings were applied temporarily to enable the American operator to secure a ciné-film depicting its new choice of equipment.

AIRWORK ORDER DC-6As

SCHEDULED all-freight services between London, Montreal and New York will be inaugurated early next year by Airwork, Ltd., the only British airline to have received authority to operate such a service from the three governments concerned. Airwork announce that they have ordered two Douglas DC-6A Liftmasters for the service, with delivery scheduled for January or February 1956. The company states that, pending delivery of the Liftmasters it will use other aeroplanes "despite the limitations involved" in order to get the service started as soon as possible.

It is expected that the type of aircraft to be used initially, the date on which the service will start, and the location of European loading points other than London will be announced shortly. The Hermes is the only type of aircraft in service with Airwork which could be regarded as at all suitable for transatlantic work. The company state that approval to buy DC-6As for "this dollar-earning service" has been granted, and that it was necessary to buy American aircraft because no British long-range freight aircraft exists. However, Airwork are working in close consultation with the Bristol Aeroplane Co. regarding the possible future use of the Britannia.

Airwork's plan to operate transatlantic freight services was originally announced in October 1952, and was approved by the M.C.A. in February 1953. Final American approval was given in April this year.

Meanwhile, foreign airlines have taken the initiative in introducing all-freight services over the Atlantic route. Keen competition already exists, as indicated by the following details of services now in operation.

K.L.M. offer three return trips weekly between Amsterdam and New York *via* Prestwick and Montreal; the company has two DC-6As, but these are not at present scheduled on Atlantic freight. Pan American Airways operate a weekly DC-6A service between New York and Frankfurt, calling at Shannon, London and Amsterdam. Sabena plan to introduce a DC-6A service shortly. T.W.A., in addition to carrying Speedpak freight panniers on their transatlantic Constellations, operate two DC-4 cargo services weekly between New York, Shannon and Frankfurt. Seaboard and Western Airlines expect to take delivery of four Super Constellation freighters shortly, with the intention of using them on the Atlantic service, although their application has not yet been finally approved by President Eisenhower.

CAPITAL'S CONTRACT for 37 Viscounts, together with the initial order for three, represents an export order to the value of $46m. Pictured at the signing ceremony are (seated): Mr. C. H. Murchison, chairman of the airline's executive committee; Mr. G. R. Edwards, Vickers-Armstrongs managing director (aircraft division); (standing) Mr. J. B. Franklin, Capital's vice-president operations and maintenance; and Mr. J. Anderson, commercial manager, Vickers-Armstrongs aircraft division.

TASMAN SOLENTS' SAFETY RECORD

THE general manager of Tasman Empire Airways, Mr. G. N. Roberts, pays a striking tribute to Short flying-boats in a message to Rear Admiral M. S. Slattery, chairman and managing director of Short Bros. and Harland, Ltd. The message reads:

"In aviation circles one never boasts of a record, because we in the industry know that the odd accident can be ever round the corner. However, on Sunday, 27th June, 1954, at 5 p.m. the last Solent officially to cross the Tasman in the name of this company, arrived at Auckland. Only then did we feel we could say that since 1940, T.E.A.L. had operated flying-boats manufactured by Short Bros. and Harland, Ltd., on these routes without causing death or injury to any of its passengers. Naturally, we are proud of this record, and our first wish would be that the manufacturers of the aircraft and the engines share the honour with us.

"Many messages of regret were sent to the company and appropriate unofficial ceremonies attended the last departures from the various ports. It is some consolation to us to know that at least one aircraft will continue to operate the Coral Route to the Islands of the South Seas from Suva to Papeete for some years to come... To take all the credit for fourteen years' successful operation would indeed be selfish. We must, therefore, pay tribute to the manufacturers of the aircraft and engine [Bristol Hercules 773] for making such a performance possible."

LUFTHANSA AGAIN

THE imminent rebirth of Lufthansa, Germany's pre-war airline, was forecast in Cologne last week. Dr. Kurt Weigelt, the chairman of the Board of Luftag—the company formed to prepare for the resumption of German air transport—told a general meeting that he hoped, regardless of whether West Germany receives her sovereignty or not, to receive a special dispensation from the Western Allies to begin flights in Europe again.

The meeting decided by a show-of-hands vote to change the name at once to the familiar Lufthansa (Deutsche Lufthansa Aktiengesellschaft). At the same time, it was decided to increase the company's capital at once from 25,000,000 Deutschmarks to 50,000,000 Deutschmarks (about £17,850,000). Finally, the shareholders formally voted to change the company's rôle from one of purchasing aircraft to that of flying them again.

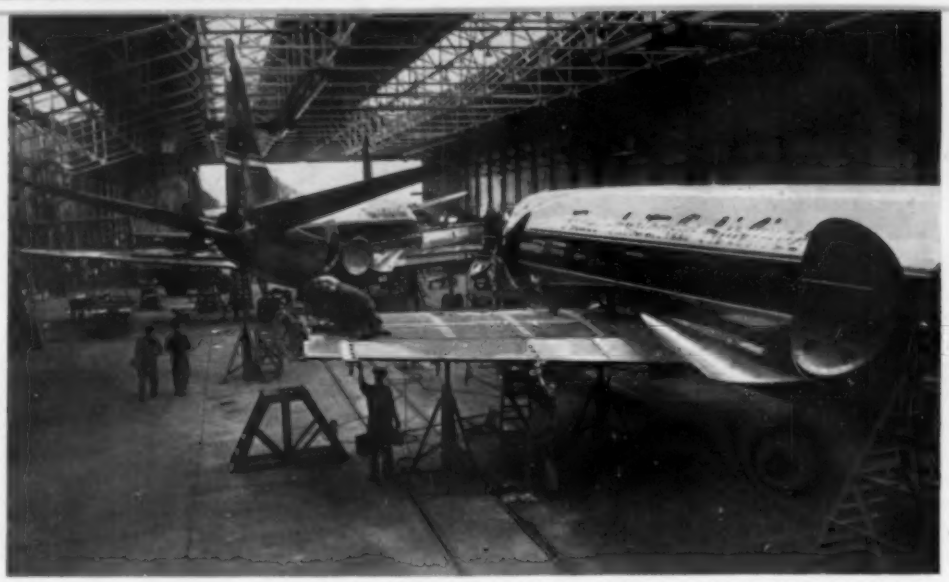
MARKETING TRANSPORT AIRCRAFT

AMONG U.S. companies engaged in the specialized business of selling transport aircraft, probably the best-known firm is that of William C. Wold Associates, of New York. Since its inception in 1949, the company has sold $15m (£5,350,000) worth of multi-engined aircraft.

Most of these machines have been executive transports, but Wold have also handled four-engined airliners for National Airlines (including the two DC-6s in service with A.N.A.), and have recently acquired exclusive sales rights for the nine Martin 2-O-2s of Pioneer Airlines. The Martins are being offered to executive operators as well as airlines, on the grounds that they are cheaper to operate and more spacious than the converted bombers used by so many companies—and almost as fast.

Over the past few years the Wold concern has built up a mailing list of over 7,000 names—"top executive, pilots, government and corporation purchasing agents, export and import firms, airlines and others throughout the world." For each new aircraft handled by the firm, an attractive brochure is prepared

CIVIL AVIATION . . .



END OF THE LINE: Nearest the camera is the fourth of six Viscounts for T.A.A. approaching completion at Hurn; three companion aircraft can also be glimpsed. The Hurn production line is designed for an output of eight Viscounts monthly.

and dispersed *via* the mailing list. This brochure shows the exterior and interior appearance of the aircraft and gives details of performance and equipment.

The response varies according to the type of aircraft offered: a Twin Beech, for example, attracts about 50 inquiries; a Lodestar brings about 30 replies; and a DC-3, 25.

Both the men behind the firm are in their thirties: Mr. William C. Wold, its founder, is 39, and his partner, Joseph T. Bara, an experienced pilot, is 34. Mr. Wold started the company in 1949 after ten years with the Consolidated Vultee Corporation.

Experience in the sale of large aircraft is not, of course, confined to America; several twin- and four-engined airliners have been, for example, among the 130-odd separate types of aircraft sold by W. S. Shackleton and Co., over the past 22 years. But for the first time costly fleets of modern transports are beginning to come on to the open market, and the activities of the Wold concern indicate that the sales broker is likely to play an increasingly important part in the process of transferring airliners from one operator to another.

AIRWORK LOSE A VIKING

VIKING G-AIXS of Airwork, Ltd., was destroyed by fire at Blackbushe Airport on August 15th. The aircraft had taken off from Blackbushe and was making a charter flight to Nice when an oil leak developed. It returned with one engine inoperative, and, for reasons which were under investigation at the time of going to press, landed short of the runway and caught fire. None of the 32 passengers was seriously injured, and about half of this number flew to Nice later in the day.

NEAR MISS OVER PARIS

OPERATING Silver Wing service BE 333 from London to Paris on August 11th, the B.E.A. Elizabethan flagship G-ALZN was in collision with an Air France DC-4. Only slight damage was caused; a seven-inch strip was torn from the wing-tip of the Elizabethan, which landed at Le Bourget and returned to London after repairs. Carrying 23 passengers, it was commanded by Capt. R. E. Gillman, who is well-known as the chairman of the Vintage Aeroplane Club in off-duty hours. The French aircraft, F-BBDP, had taken off from Orly to fly to Düsseldorf. After the incident it returned to Orly. Both aircraft were in cloud when the collision occurred; G-ALZN had received clearance to enter the Paris control zone, and met the DC-4 while letting down from 7,500 to 5,500ft.

Subsequently it was announced that Mr. J. W. Gibbs, B.E.A. air safety branch, and Mr. N. C. Hutchinson, B.E.A. traffic-control officer, had been to Paris to discuss the incident with French air-traffic authorities and a representative of Air France. French ground control later admitted responsibility and said that no blame attached to either pilot.

Arrangements for separating Le Bourget and Orly traffic were, it is understood, revised as a result of this affair, with its frightening possibilities.

SINGLE FINN: This Convair 340, pictured at Bromma Airport, Stockholm, wears the blue-and-white livery of Finnair. In the background, airborne and en route for London, is a B.E.A. Viscount.

A.N.A. CHAIRMAN HERE

NOW in Britain on a 10-week business tour is Capt. Ivan Holyman, who has headed the largest independent airline in the Commonwealth since its inception in 1936. His name first became known in the airline industry in 1932, when Capt. Holyman and his late brother Victor bought a D.H. Fox Moth to operate between Launceston and Flinders Island. The firm of Holyman Bros. subsequently became Australian National Airways, now employing nearly 4,000 people and operating a fleet of 35 multi-engined aircraft.

Capt. I. N. Holyman.

At A.N.A.'s Regent Street office, Capt. Holyman told us that he will be attending next month's S.B.A.C. Show at Farnborough and the I.A.T.A. meeting at Paris the following week. He emphasized that his business here is only partly aeronautical; he is chairman of several companies apart from A.N.A., and controls large shipping interests in Australia. Nevertheless, he will be visiting friends in the aircraft industry, including those at Blackburn, Bristol, de Havilland and Vickers-Armstrongs.

A.N.A.'s State-owned competitor, T.A.A., will shortly be taking delivery of the first of six new Viscounts. At one time it was thought that A.N.A. might also buy the British turboprop airliner, but a year ago contracts were signed for the purchase of two DC-6s, formerly operated by National Airlines, and two new DC-6Bs. The DC-6s were delivered last December, and the '6Bs will arrive in February or March next year.

Capt. Holyman is aware that the decision to buy American evoked some disappointment, if not criticism, in this country, but feels that it was the only one practicable at the time. Improved aircraft were needed urgently, and A.N.A. were able to secure almost immediate delivery of the ex-National DC-6s. The company was the first airline in the Commonwealth to buy both DC-3s and DC-4s; these have given extremely good service and represent 90 per cent of its fleet. The addition to the larger Douglas aircraft, therefore, is a relatively straightforward step both from the operational and the maintenance aspects.

STILL GOING STRONG after seventeen years' service, the Beech Model 18 is still among the most popular executive transports. As reported below, the improved Super 18 version is now in production; shown here are the revised lines of cabin, cockpit, nose and wing-tips.

FINNISH ROUTE TO LONDON

ON September 1st at 2015 a Finnair Convair 340 is due to arrive at London Airport, thereby inaugurating a new thrice-weekly service linking London and Helsinki. This new service, which will fly westbound on Mondays, Wednesdays and Fridays and eastbound on Tuesdays, Thursdays and Saturdays, will be routed *via* Copenhagen and Düsseldorf.

Finnair is the name adopted last year by Aero O/Y, Finnish Airlines, a company which was founded on November 1st, 1923, and which began operations on a route from Helsinki to Reval.

The second Finnish air route was that between Helsinki and Stockholm, which opened on June 1st, 1924, closed that August through financial difficulties and re-opened in May, 1925. These early routes were operated only in the summer months and they were all flown by Junkers-F 13 single-engined floatplanes. Helsinki did not have a land airport until Malmi was opened in 1938.

B.E.A. will act as general agent in the United Kingdom for Finnair, and Mr. O. Juntunen will be Finnair representative at London Airport.

BEECH SUPER 18

AT Wichita, Kansas, the Beech Aircraft Corporation has just completed the first production version of the "stretched" Model 18 with higher performance and greater capacity. Designated Super 18, the new Beechcraft first flew as a prototype in December 1953. It embodies several improvements, including jet-type exhaust stacks for the 450 h.p. P. and W. R-985 AN 14Bs; longer nose containing radio equipment; redesigned wing-tips and cockpit; extra, larger windows; higher cabin ceiling; and larger cabin doors.

All-up weight of the Super 18 is 9,300 lb, 550 lb heavier than the previous model. Maximum speed at 5,000ft is 234 m.p.h., and cruising speed at 10,000ft (66.7 per cent of max. power) is 215 m.p.h., giving an extreme range—with 45 min reserve—of 1,120 miles. A cruising speed of 182 m.p.h. at 10,000ft gives a range of 1,455 miles with the same reserve.

Production of Super 18s will be at the rate of eight per month by October; more than 30 will be delivered by the end of the year. The backlog extends well into next year and is valued at over £1,400,000.

AIR-TRAVEL APPOINTMENTS

THE appointment (to take place in the near future) has been announced of Mr. Harold Bamberg, managing director of the Eagle Aviation, Eagle Aircraft Services and Air Liaison companies, as chairman and managing director of Sir Henry Lunn, Ltd., the travel agency, in which he has recently acquired a financial interest. It is expected that Air Liaison, Ltd., a travel company specializing in air travel, will be closely associated with Sir Henry Lunn, Ltd., in the future, and that the overall travel facilities offered will be considerably increased.

Although neither company has divulged any definite plans for an increased co-ordination of activities with Eagle Aviation, Ltd., it is reasonable to assume that the charter company's aircraft may be used in the increase of travel facilities mentioned, particularly in the field of inclusive holiday tours abroad.

BREVITIES

WEST African Airways experienced a remarkable response to a recent offer of 5s pleasure flights in a Bristol Freighter from Accra. Africans travelled up to 100 miles for a flight, and police had to be called to control the crowds. The Freighter made 20 flights, carrying 800 passengers.

* * *

India's decision to cancel her bilateral agreement with America has been criticized in the U.S. House of Representatives. Mr. Carl Hinshaw (Republican, California) said that India stood to benefit by encouraging American tourists, who were at present provided with ten flights weekly to India by U.S. carriers; other countries, he said, had "demonstrated a similar tendency to restrictionism" since India announced her intention to terminate the agreement.

* * *

The Council of the Air Registration Board announces the issue of procedures leaflets dealing with the chromating of magnesium alloys; with pneumatic systems; air conditioning systems; bonding and circuit testing; and safety belts and harness. Also newly issued is *Notice to Licensed Aircraft Engineers and to Owners of Civil Aircraft No.* 9, *Issue* 3, dealing with aircraft maintenance schedules and certificates of maintenance.

* * *

Japan and Brazil are discussing details of a bilateral agreement providing for air services between the two countries. A Japan Air Lines DC-6B is expected to make a goodwill flight from Tokyo to Sao Paulo *via* Wake Island, San Francisco, New Orleans and Caracas, arriving on October 10th. It will carry Japanese Government officials and business representatives.

* * *

Cathay Pacific Airways, whose DC-4 was shot down off Hainan Island by Chinese Communist fighters on July 23rd, resumed their service from Hongkong to Bangkok and Singapore on August 12th. In command was Capt. Philip Blown, the Australian pilot involved in the shooting incident. The replacement DC-4 was bought from Canadian Pacific Airlines.

* * *

From mid-September, the number of B.O.A.C. services from Britain to West Africa will be increased from eight to ten flights weekly. Both the additional services will be first-class; seven of the present flights to West Africa—serving Lagos, Accra and Kano—are first-class and one is a tourist service.

* * *

On August 9th a Sabena DC-6B began the company's 3,000th flight on the Brussels-Congo route. Of this total, two-thirds have been flown in the past four years. When the service began in 1935, the journey took 5½ days (106 hr flying time); today, the DC-6B flies from Brussels to Leopoldville *via* Geneva and Kano in 18 hr elapsed time, 16 hr flying time.

* * *

Bristol 170 F-VNAI of Air Vietnam was destroyed at Pakse, Laos, on August 16th while making a charter flight for the French Union Forces from the Red River delta to Saigon. The aircraft is reported to have fallen into a tributary of the river while attempting a single-engined landing. Of the 51 passengers, 46 lost their lives; three of the crew of four survived.

* * *

The two B.O.A.C. Comet 1s remaining at London Airport are to be Cocooned for indefinite storage. Four other Comet Is are undergoing tests at Farnborough.

* * *

Forty D.M.E. beacons have been or are now being installed in Australia and New Guinea as part of a programme calling for the eventual installation of 73 beacons. Use of D.M.E. on Australian airways will become mandatory after February 1st, 1955.

* * *

The 1,243 pilots of American Airlines were still on strike as this issue of *Flight* closed for press. The company announced last Friday that unless the strike ended nearly 16,000 employees would be laid off before the end of the month.

* * *

The assessor appointed to study B.E.A.'s estimate of probable savings resulting from the transfer of maintenance work from Renfrew to London is Mr. J. A. Walker, partner in an Edinburgh firm of accountants.

* * *

Following the success of last year's inaugural event, it has been decided to hold another Airlines Ball at the Royal Albert Hall on October 15th. Dancing, from 8 p.m. to 2 a.m., will be to the bands of Geraldo and Teddy Foster.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Hendon—A Suggestion

NOW that it is officially pronounced that Hendon airfield is to be closed as an Air Ministry flying area, perhaps it is not inopportune to suggest its ideal future.

A site has long been sought for housing vintage aircraft and generally accommodating a collection of exhibits covering the sphere of aeronautical history.

What better venue than Hendon, with its record of past events? The old Grahame-White gates still stand as a memory of the pioneer days, and the site is even more accessible by public or private transport than in the days of the many pageants held there.

A more closely associated centre it would be hard to find for such a purpose, with still ample space for the customary A.T.C. activities, and the occasional gatherings of commemoration among the fraternity of the air.

London, N.W.9. V. N. BUTLER.

Clanger

I HAVE just seen your Editorial in the issue dated July 2nd, in which, in referring to helicopter and other noises, you state:—"Many have already been spared the equally loud and irritating tramways noises since these fearsome antiques were finally and belatedly removed. (Our apologies to Sydney, N.S.W., where new tracks are just being laid.)"

In actual fact your apologies are due to Sydney, not because they are laying tracks, but because they have decided not to do so. It is Melbourne, Victoria, which is laying new track.

Maybe your apologies are due to them; particularly as they seem to be quite proud of the fact, and you have mistaken them for Sydney. An unpardonable crime!

Melbourne. D. H. BLACK.

[For going off the rails, our apologies to Sydney.—Ed.]

Airliners in Warpaint

IN your issues of July 23rd and August 6th, Messrs. G. Alan Hill-Reid and D. G. Thorpe reminisce on the Short G-class flying-boats. Mr. Thorpe recalls the loss of *Golden Horn* with all hands, during a test flight from Lisbon.

In fact, there was one survivor, R/Off. Uttley, who had a remarkable escape and whose evidence did much to speed the solution of this accident.

Engine fire followed a mechanical failure which began with piston trouble, and the absence of feathering props made it more than usually difficult to deal with the situation. Dense smoke entered the flight deck through an open drift-sight hatch in the wing root, aided by the extractor effect of an open "clear-view" panel in the cockpit.

At the time when the boat should have been levelling off above the River Tagus the tail unit control surfaces had been badly damaged by fire; the boat struck hard, the hull opened, and she sank.

I do not think R/Off. Uttley remembered how he got out of the hull; but, finding himself many feet down in the water, he was sufficiently alert to realize that he must not break surface at once as there was a patch of burning fuel right above him. With great presence of mind he swam out beyond the periphery of the fuel patch and was rescued.

Colnbrook, Bucks. N. G. BENNETT,
Chief Engineer, Graviner Mfg. Co., Ltd.

FOR the assistance of future historians who may refer to your correspondence columns I would like to amplify the information relative to *Golden Hind* contained in the letter from Mr. Hill-Reid published in your issue dated July 23rd.

This aircraft was delivered to Short Bros. and Harland's works at Belfast on September 27th, 1945, wearing registration letters G-AFCI plus red, white and blue flashes. It also had provision for midships and rear turrets.

The Certificate of Airworthiness showed the owners as B.O.A.C. at the registered address Grand Spa Hotel, Clifton, Bristol 8. This certificate was validated monthly from January 10th, 1943, to March 10th, 1943. It was not valid between March 11th, 1943, and May 17, 1943. It was revalidated until May 17, 1944, and became invalid from May 18th, 1944, until July 6th, 1944, when it was again revalidated until July 6th, 1945. An extension was granted validating the certificate until August 6th, 1945.

The aircraft was overhauled at Belfast and converted to carry 24 passengers. The luxurious appointments included ladies' and gentlemen's toilets, a galley and the "beautifully panelled cocktail-bar" (referred to by an earlier correspondent), where also there was a comfortable settee.

Golden Hind was delivered to B.O.A.C. at Hythe on a Permit to Fly, on September 12th, 1946. It was taken out of service at the expiration of the Certificate of Airworthiness on September 25th, 1947, and was transferred from Hythe to Poole on November 18th, 1947. On being purchased by a private owner it was ferried to Rochester on April 17th, 1948, a Permit to Fly having been granted for this flight.

The aircraft remained at Rochester until it was wrecked while being towed away this year.

Crawfordsburn, Co. Down. J. C. CORLETT.

Supersonic Speed Record?

WITH the advent of the English Electric P.1 prototype there arises a chance to the British aircraft industry that will never arise again. Surely, with this aircraft, it would be possible for the United Kingdom to establish the world's first truly supersonic airspeed record, which would always remain a landmark in the progress of not only British but world aviation, and would also add incentive and enthusiasm to the industry as a whole.

If the record were to be attempted this year, the decision would have to be made soon (were it to be done in the British Isles) and preferably, of course, before the S.B.A.C. show at Farnborough.

Bristol, 3. PAUL B. HAWKINS (age 15).

Dutch Roll

WITH reference to your interesting article "The Baroudeurs Advance," you state, "it has, however, had its share of that current element, dutch roll." This statement is perfectly true and it was realized in the very early days that automatic stabilization would be an essential requirement.

This company, working in close conjunction with M. Jakimiuk, fitted a stabilizer which delighted M. Nadot (the pilot), negatived the rather excessive dutch roll of the prototype and brought the performance of the aircraft within N.A.C.A. requirements.

We are continuing our collaboration with S.N.C.A.S.E. in the stabilization of the four pre-production aircraft, which have improved dutch roll characteristics compared to the prototype.

Technical Sales Manager—Aviation, E. G. MONK.
Elliott Brothers (London), Ltd.

[In congratulating Elliott Brothers upon their work on the Baroudeur, we may also refer to our issue of December 18th last, in which was recorded their similar stabilization of the Dassault Mystère IV.—Ed.]

FORTHCOMING EVENTS

Aug. 28. Southern Aero Club: Goodyear Trophy Race, Shoreham.
Aug. 18-28. "Model Engineer" Exhibition, London.
Aug. 29. Yeadon Aero Club: "At Home."
Aug. 29. R.A.F. Gliding School, Kenley: "Open Day" and flying display.
Aug. 29-30. Pescara Aero Club: Annunzio Trophy contest, Pescara, Italy.
Sept. 5. Soar Aero Club: Europa-Pokal display.
Sept. 6. Society of Licensed Aircraft Engineers: "Medical Aspects of Aircraft Engineering," by W/C. F. Latham, M.D., B.Sc., Ch.B. (at R.A.E., Farnborough).
Sept. 6. S.L.A.E. Main Lecture. "The Medical Aspects of Aircraft Engineering" by W/C. F. Latham 6.30 p.m. in the Assembly Hall, Royal Aircraft Establishment, Farnborough.
Sept. 7-12. S.B.A.C. Farnborough Display and Exhibition. ("Public" days, 10th, 11th and 12th).
Sept. 9. Helicopter Association: "Helicopter Contracting," by Knute Flint. (Followed by annual dinner.)
Sept. 9-12. Royal Aero Club: International invitation air rally, White Waltham.
Sept. 13-19. Battle of Britain Week.
Sept. 16-17. Aerodrome Owners' Association: Annual Conference, Northampton and Sywell.
Sept. 18. R.A.F. "At Home" Day.
Sept. 25-26. Aero Club of Germany: Hanseatenflug international rally.
Sept. 20-29. Fédération Aéronautique Internationale: 47th annual general conference, Istanbul.
Sept. 29. British Institution of Radio Engineers: "Computing Circuits in Flight Simulators," by A. E. Cutler, B.Sc., Ph.D.
Oct. 11. Institute of Transport: Presidential address by Sir Gilmour Jenkins, K.C.B., K.B.E., M.C., M.Inst.T.
Oct. 15. Rochester Flying Club: Annual dinner and dance, Bearsted.
Oct. 15. Helicopter Association: "Application of Gas Turbines to Helicopter Propulsion," by J. Brown.
Oct. 15. The Airlines Ball, Royal Albert Hall, London, 8 p.m.-2 a.m.

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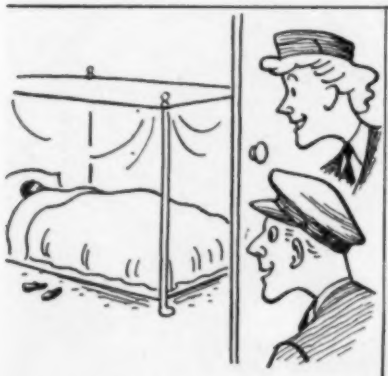

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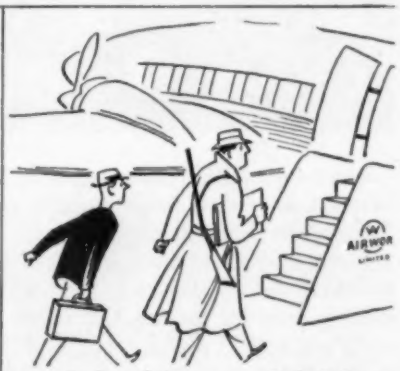

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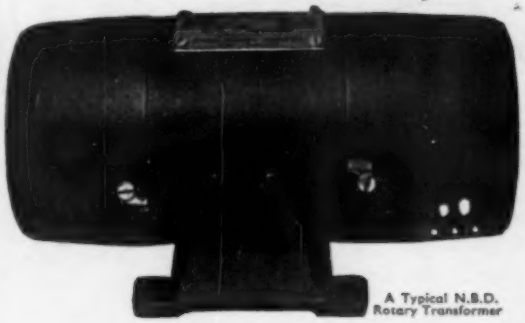

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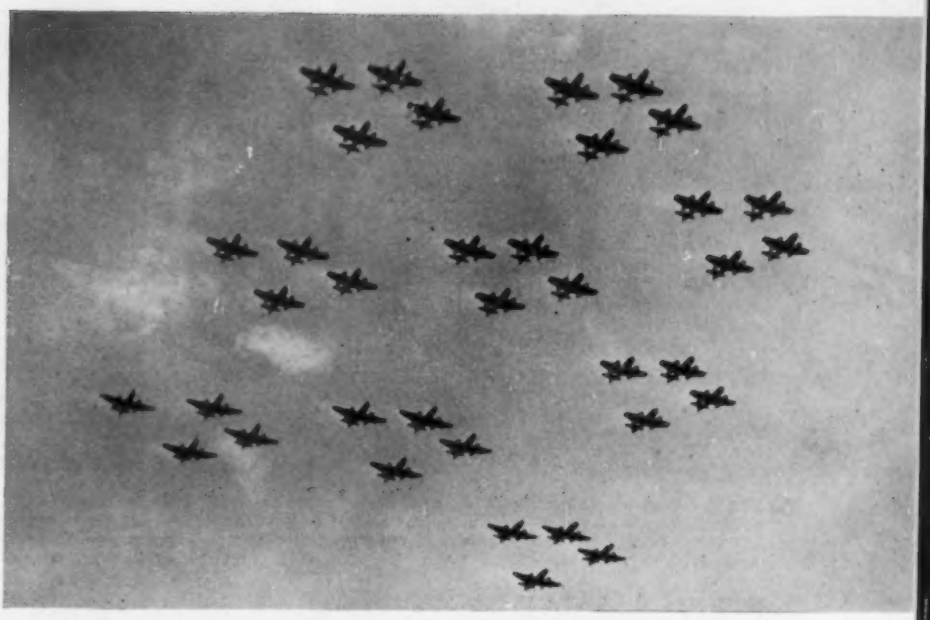
SERVICE AVIATION

Royal Air Force and Fleet Air Arm News



SCOTTISH WING: A fine Meteor formation over Leuchars, Fife, on the occasion of the recent visit by the Secretary of State for Air, Lord De L'Isle and Dudley, V.C., to inspect the station and present a new station badge. The Minister flew north from West Malling in a Vampire Trainer.

Shackletons on 40,000-mile Flight

FOUR maritime reconnaissance Shackleton aircraft of No. 206 Squadron, Coastal Command (S/L. J. D. Beresford), left their base at St. Eval, Cornwall, last week on a 40,000-mile tour, during which they will participate in maritime exercises in the Indian Ocean, off Ceylon, and make goodwill and training visits to Australia, New Zealand and Fiji.

The detachment is commanded by G/C. R. Faville, C.B.E., officer commanding R.A.F. Station, St. Eval, who is captain of one of the Shackletons. The other three aircraft are captained by S/L. Beresford, F/L. R. F. Salmon, and F/L. A. E. M. Barton.

Two of the Shackletons took off from St. Eval at 1940 hr (B.S.T.) on August 12th, carrying 29 members of their ground servicing crews, and proceeded to Negombo, Ceylon, *via* the R.A.F.'s North African staging post at El Adem and Khormaksar, Aden.

The other two aircraft left St. Eval with 31 ground servicing personnel on board on Friday, August 13th, to fly to Ceylon by way of Habbaniya, Iraq. The four aircraft, converging on Negombo in pairs by different routes, met over Ceylon and landed at Negombo on Sunday last.

In Ceylon, between August 18th and 28th, the Shackletons will take part, with warships of the Royal Navy, Royal Pakistan Navy, Royal Ceylon Navy, and the Indian Navy, in a combined maritime-air exercise planned jointly by the Royal Naval Commander-in-Chief, East Indies, and the A.O.C. Air Headquarters, Ceylon. The exercise is in reality a series of small operations in Ceylonese waters, culminating in a larger operation.

Before leaving Ceylon the Shackletons will be joined by two Hastings of R.A.F. Transport Command from the United Kingdom, which will accompany the Coastal Command aircraft to Australia, New Zealand and Fiji, carrying additional spares and ground staff.

Leaving Negombo on August 31st, the Shackletons and Hastings will fly to the civil-military airfield at Nandi, on Viti Levu Island, Fiji, by way of Changi (Singapore), Darwin (Australia), the R.A.A.F. station at Richmond near Sydney, and the R.N.Z.A.F. station at Whenuapai, near Auckland.

At Whenuapai, where the aircraft spend five days, the Shackletons will participate in joint exercises with R.N.Z.A.F. maritime reconnaissance squadrons, and R.A.F. officers will give lectures to New Zealand aircrews and to audiences at the Air and Navy Departments in Wellington.

In Fiji the Shackletons will carry out exercises with a R.N.Z.A.F. Sunderland squadron based there, and Coastal Command officers will lecture to the R.N.Z.A.F. aircrews on the latest procedures and techniques of maritime reconnaissance flying. On the homeward flight, the Shackletons are expected to make a brief stop at the R.A.A.F. station at Townsville, on the Queensland coast.

R.A.F. Appointment

WITH effect from last Tuesday, A.V-M. H. A. Constantine, C.B., C.B.E., D.S.O., became A.O.C. No. 25 Group, Flying Training Command.

For the past two years A.V-M. Constantine has been A.O.A. at Fighter Command H.Q. and before that was Director of Intelligence at the Air Ministry. At the outbreak of war he was an examining officer at C.F.S. and after a Staff College course in 1940 served with Bomber Command until the end of hostilities.

R.A.A.F. Flying Training

TO evaluate the changes required in training jet pilots the R.A.A.F. has recently conducted a jet training course for pilots after only 90 hours flying. Under the old system pilots had 40 hours *ab initio* training on Tiger Moths and then 50 hours intermediate training on "Wirraway" types followed by 100 hours applied flying training on Wirraways before being selected for jet training. Under the scheme now being tried they go straight to jets after the 90 hours. Eight pilots have just completed the course and a second course is starting at once. When the second course has been completed a very careful check of the results will be made by instructors, aviation medicine specialists, statisticians and psychologists to evaluate all aspects of the training and to compare them with the standard system. The panel will review the effectiveness of the Vampire aircraft as a jet trainer and decide the stage at which trainees should commence jet training.

No. 206 Group Badge

AT a ceremonial parade held recently at No. 206 Group Headquarters, Abyad, in the Suez Canal Zone, before a distinguished audience of senior R.A.F. officers, the C-in-C. Middle East Air Force, Air Marshal Sir Claude Pelly, presented the Group with its Unit Badge, approved and signed by the Queen.

The badge, the motto of which is "Support to the Wings," was received by the A.O.C. 206 Group, A. Cdre. M. S. Shapcott.

Freedom of Grimsby

ON the afternoon of Saturday, September 11th, during a ceremony in the People's Park, the Marching Freedom of the Borough of Grimsby is to be conferred on No. 12 Squadron, based at Binbrook.

Reunions

A BATTLE of Britain reunion buffet supper party will be held at R.A.F. Station, Biggin Hill, on Wednesday evening, September 15th, at 6.30. Dress will be lounge suits.

Serving and released flying personnel who flew in fighter aircraft in the Battle of Britain between July 10th and October 31st, 1940, and are eligible to wear the clasp of the 1939-45 Star should apply for tickets (30/- inclusive) as soon as possible, to the Secretary, Battle of Britain Reunion Committee, Officers' Mess, R.A.F. Biggin Hill, Kent.

OUTLOOK SETTLED: A new view of the Auster A.O.P.9 (Blackburn Cirrus Bombardier engine), now in production at Rearsby. An exceptionally wide field of view is reconciled with a lively performance and good weight-carrying qualities.

Cdr. C. J. W. Simpson, D.S.C., R.N., leader of the expedition greets S/L. E. C. Bennett, D.F.M., Commanding Officer of No. 230 Squadron R.A.F., on arrival at Britannia Lake, to fly the expedition back to Britain. (Right) The second pilot says "I hear you have had some very fine arctic weather down south this year." Some of the husky dogs were handed over to the Danes.

SERVICE AVIATION . . .

GREENLAND EXPEDITION RETURNS

A FOUR-YEAR task was completed last week when Coastal Command Sunderlands of No. 230 Squadron, Pembroke Dock, fetched back the members and stores of the British North Greenland Expedition from Britannia Lake and Young Sound. In 1951, Cdr. C. J. W. Simpson, D.S.C., R.N., the leader of the expedition, was flown north to make a preliminary survey of the Young Sound-Britannia Lake area. In 1952, assisted by Hastings of Transport Command, the members of the expedition and some 130 tons of stores were transported to the base camps. One of the Hastings, while making a low drop, made an unintentional landing in the snow and the crew members had to await rescue by American aircraft operating from Thule. Last year, during October, re-supply flights were made.

The unusual weather, which seems to have been world-wide this summer, caused considerable anxiety during the evacuation. There was much more ice present than on previous occasions and the Sunderlands left Greenland about a week ahead of schedule —but all the essential material was cleared from Britannia Lake, over which at one time four Sunderlands were to be seen. Two of the flying boats made a complete air survey of the area in order that an accurate large scale map can later be prepared in connection with the researches of the expedition.

During the evacuation the Station Commander of Pembroke Dock flying boat base, G/C. W. P. Welch, and other officers, flew up to visit the scene of operations. They returned south the same day carrying the photographic material from the air survey for processing and for checking to ensure adequate coverage.

(Above) Flown by S/L. Bennett, Sunderland "P for Peter" was the first to arrive at Britannia Lake. It is shown flying over Young Sound. (Below) Tidy arrival. The four Short Sunderlands of No. 230 Squadron make a symmetrical breakaway over Milford Haven on completing the journey from Greenland. (Right) Cdr. Simpson steps into the waiting dinghy to go ashore in Britain after two years' absence.

A NEW AIRCRAFT BATTERY

IN the design of aircraft batteries there is now a tendency—officially encouraged—to standardize on a minimum number of sizes and capacities. This applies to batteries for both military and civil types and to American as well as British aircraft.

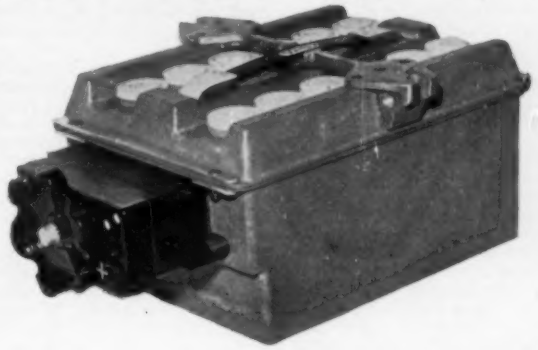
Now producing (under an Air Ministry development contract) a battery conforming to the most popular of these new standards is Varley Dry Accumulators Ltd., of By-Pass Road, Barking, Essex. The firm is an old-established one which, since 1937, has been manufacturing batteries of a patented form of construction. This method, very briefly, depends on the use of extremely thin plates which are in effect compressed into, and supported by, their separators. The result is that highly porous plates can be used, with a considerably enlarged total surface, conferring consequently improved electrical efficiency, particularly in the delivery of heavy currents, and a lower internal resistance.

These advantages, state the manufacturers, permit the production of batteries which can be either (a) smaller and lighter than conventional types, yet of equivalent capacity with improved electrical efficiency, or (b) of the same size, but achieving very much higher capacity without any increase in weight.

The new 24-volt Varley aircraft battery is, in fact, claimed to have the lowest weight/energy ratio ever achieved in lead-acid battery construction—a consideration particularly important in jet aircraft, as the starting of gas turbines makes very heavy demands on batteries. Designated Type 24.19/25, the new Varley has a capacity of 20 a.h. at the two-hour rate and weighs only 38 lb filled. Base dimensions are 9 15/16in wide × 7 11/16in deep, and the height is 6 1/8in. The plates and separators are assembled in two 12-volt monobloc moulded containers made of shock-resistant polystyrene, and these two units are housed in a polyester/glass wool outer case. Terminals can be either of the prong type conforming to B.S.I. 2G.131 or of a modified Cannon double-pole type.

The Varley, it is claimed, can withstand excessive line-voltages better than conventional types of lead-acid battery, and has less tendency to "run away." There is also reduced risk of damage through over-charging.

The battery is fully aerobatic; it has been subjected to tests on a g-testing rig maintained by a well-known aircraft manufacturer, and has also been tested by the R.A.E., Farnborough, prior to official approval by Rolls-Royce, Ltd., and a number of aircraft constructors. One of the latter was Vickers-Armstrongs, who (as we reported in January) sent Viscount G-AMAV to Scandinavia last winter with the primary object of trying out the cold-weather starting performance of Varley batteries. The 24.19/25 battery has been specified by Vickers-Armstrongs for the Vickers Viscount and by the Bristol Aeroplane Co. for the Britannia. The Viscounts for Trans-Canada Air Lines and for British West Indian Airways are now being equipped with these batteries. It has also been adopted by the Air Ministry for a number of Service aircraft in the bomber, fighter, advanced trainer and helicopter categories.



The new Varley aircraft battery.

Cargo Incognito

AIRLINES in some of the more remote areas abroad regularly carry mixed passenger and cargo loads—"mixed" being the operative word, for the passengers find themselves sharing the cabin with the oddest assortment of articles, small and large, occupying space made by the removal of seats, or even piled on any seats left vacant.

In other parts, passengers are less uncritical and would feel affronted to find themselves travelling in something resembling a luggage-van. Nevertheless, traffic sometimes demands that freight shall be carried in passenger compartments. How to do so in the least obtrusive manner has long been a problem for operators. Bins or containers can be used, but this involves removal of seats, an inconvenient process when the composition of the total load is not known well in advance; and, unless folding chairs are installed, it also means the leaving behind of seats that may be needed on later stages of the route.

An ingenious method of overcoming this difficulty has been evolved by Latex Upholstery, Ltd., of 41 Lonsdale Road, London, W.11, who have designed the "Kargo Pak"—in effect, a container that literally sits on the seat and rests its "feet" on the floor. Actually, and unlike a human passenger, it can comfortably sit on two, or even three, seats at the same time.

The makers state that B.O.A.C. have used Kargo Paks with satisfaction over a period of six months and that, employing them on some 90 per cent of their regular services, have found them to increase deadload earning capacity by between 10 and 15 per cent.

The Kargo Pak, which can be supplied in colours to match aircraft interiors, is made of 12½ oz continuous-filament nylon cloth, which gives an optimum degree of strength, lightness and fine resistance. It is bonded by lengths of 1½in webbing each of which is stated to be capable of taking a 900 lb load, and is closed by two flaps secured by 800 lb Harley buckles; two side flaps, drawn over the main flaps and secured by press-studs, give a neat finish. The usual method is to load the Kargo Pak *in situ* and, when loading is completed and the flaps secured, it is fastened in the seat by means of the normal passenger lap-strap, which is passed through two loops in the webbing bonding.

So that it may "sit" on two seats at once, the Kargo Pak is provided with a gusset which fits over the seat armrest; the triple-seat type has two such gussets. An additional type also has extending gussets to give additional capacity. Capacities of these various types range from 21½ to 24½ cu ft (0.6 to 0.7 cu m) and their weights from 7¾ to 10 lb (3.5 to 4.5 kg). For stowage, a Pak is contained in a nylon bag, measuring about 16in × 16in × 5in, provided with a webbing handgrip.

S.B.A.C. SCHOLARSHIP WINNERS

THE Society of British Aircraft Constructors has issued the following details concerning successful candidates for its university and educational grants (these grants are awarded annually to selected personnel in the Industry):—

The Society's standing committee on education has granted second-year scholarships to W. P. A. Harris and J. E. Wingate, tenable at the College of Aeronautics.

The following candidates were awarded the three 1954 University Scholarships: R. F. Ayers (Handley Page, Ltd.), N. Birch (Boulton Paul Aircraft, Ltd.), M. R. Williams (Bristol Aeroplane Co., Ltd., engine division). These three students will be going to the College of Aeronautics.

Five boys were awarded educational grants and will serve apprenticeships with the companies indicated: M. D. Chamberlain (de Havilland Engine Co., Ltd.), B. J. Fines, R. F. H. Owston and A. E. Pryce (de Havilland Aircraft Co., Ltd.), R. De Saeger (Rolls-Royce, Ltd., subject to acceptance).

STANDARDS YEARBOOK

RECENTLY published is the *British Standards* 1954 *Yearbook*, which list no fewer than 2,500 British Standards current at March 31st, 1954, and gives a brief description of the subject matter of each. A comprehensive index simplifies reference.

The usual information on the membership of the Institution's general council, divisional councils and industry standards committees is given, together with the names of representatives on the main special committees and advisory committees. Particulars of the work in hand by all the industry standards committees are also given.

British Standards under which the Institution's certification trade marks are used are listed beneath the following headings: Electrical; building; plastics; bedding and furniture; personal safety; miscellaneous.

Copies of the *Yearbook*, price 12s 6d, may be obtained from the British Standards Institution, British Standards House, 2 Park Street, London, W.1.

THE INDUSTRY

For Brighter Aircraft

SMARTNESS in the exterior appearance of aircraft is nowadays insisted upon by most operators, both civil and military. Well-polished surfaces reflect—almost literally—the efficiency of the owners and, to a greater or lesser extent dependent upon the type of aircraft, have a beneficial effect upon aerodynamic performance.

To achieve real efficiency, a polish must meet two conflicting requirements: (a) it must remove dirt, corrosion and oxydization and (b) it must do so with the absolute minimum of abrasive effect and must contain no chemical which is corrosive or otherwise damaging. A preparation which appears well able to meet these requirements is "Jove Wadpol" combined aircraft cleaner and polish, approved to M.o.S. specification D.T.D. 900/4258, and manufactured by Valay Industries, Ltd., 186 Campden Hill Road, London, W.8. It takes the form of an impregnated wadding with which the surface is lightly rubbed, the moist film then being polished off with a soft dry cloth. Each piece of wadding used in this way can be repeatedly used until worn out.

A complementary preparation by the same firm is "Jove Aerowax" (type CX3 liquid wax) which, applied either by spray-gun or cloth, provides a high-gloss protective coating over the newly polished surface. The liquid is of a kind which, unlike some waxes, can be applied evenly over considerable areas without difficulty; and it may be washed down, by normal methods, without harm to the film.

The makers state that, though the present D.T.D. approval applies only to "Wadpol" used on metal surfaces, both this material and "Aerowax" are also effective on a wide variety of aircraft painted finishes, including the modern high-speed finish. The principal claim made for both products is that they give a smooth, highly durable finish with the implicit advantage that this will stand up to a great deal of weathering—incidentally, in extremes of temperature.

The nature of "Wadpol" makes it unspillable, but for those who prefer a liquid cleaner a third preparation, "Jove Aeropol" combined cleaner and polish, is available.

We understand that in the comparatively short time in which these compounds have been on the market they have gained considerable popularity. The makers state that "Wadpol" has been the standard polish for metal surfaces in the R.A.F. since the beginning of last year and that it has been used for a considerably longer period on the Vikings of the Royal Flight. The R.A.F. is also using "Aerowax" on helicopter rotor blades. Other air forces have adopted the polish, and a large proportion of the company's turnover is, in fact, for dollar currency. In addition, several manufacturers and nearly a dozen airline operators, including B.O.A.C. and B.E.A., are using one or more of the three preparations.

Hand Calculator

WE have recently received brief details of the Curta calculating machine, illustrated here. It is an unusually neat and portable instrument, and it can be held and operated by one hand.

Two basic types are available: Model 1, with an eleven-figure range, which weighs 8 oz, and Model 2, with a fifteen-figure range, weighing 12 oz. Both types are 3½in high. With these machines, addition, subtraction, multiplication, division, squaring, cubing and the extraction of cube roots are possible, with a range of values and a speed of operation claimed to be competitive with that of desk machines of very much greater size and weight.

A Curta calculator, of the pattern described above. The overall height is 3½in.

The Curta machines are silent in operation, and are made of high-quality rust-proof steel. They are provided with tens transmission and visible dials throughout, together with a reversing lever and provision for split clearance of the product register. In England these machines are marketed by London Office Machines, Terminal House, Grosvenor Street, London, S.W.1.

Thermal Control in France

AN agreement was recently signed between the Speed Development Co., Ltd. (Thermal Control Co., Ltd.), and Souriau et Cie, 9-13 Rue General Gallieni, Billancourt (Seine), France, for the latter concern to manufacture Thermal Control fire-detectors and pressure switches under licence. This arrangement covers the rights for both France and French possessions.

Previously, Thermal Control (whose H.Q. in this country is at Marine Works, Sackville Road, Hove, Sussex) had been represented in France by Société World Market et Cie, 19 Rue du 4 Septembre, Paris (2e). Under the new agreement Société World Market will instead act as representatives in France and French possessions for Souriau et Cie.

This 10-way spanner is a product of the Leytonstone Jig and Tool company, and it is retailed at 18s 9d. The plated hand grips slide along each side; three standards are available—Whitworth, S.A.E. and Metric.

IN BRIEF

Senior appointments notified by Normalair, Ltd., include those of Cdr. F. W. N. Bassett, R.N. (Retd.), director and commercial manager, who becomes commercial director; Mr. D. C. Collins, a director, now appointed works director; and Mr. W. Oppenheimer, F.C.A., formerly financial adviser, who becomes finance director.

* * *

The Saunders Valve Co., Ltd., state that they have appointed Simmonds Aerocessories Inc., Tarrytown, New York, as their main licensees for the North American continent; and that Simmonds Aerocessories of Canada, Ltd., Montreal, are appointed their special licensees and agents for Canada.

* * *

New tyre-testing equipment has recently been supplied by Heenan and Froude, Ltd., of Worcester, to the Dunlop Rubber Co., Ltd., at Fort Dunlop, Birmingham. Like others supplied in the past, the new machine has been built to Dunlop design; bascially it consists of a 60in steel drum capable of being motored at speeds up to 448 r.p.m. while the tyre under test is pressed into contact with it. Motoring power at full speed is 100 b.h.p., and tyres of from 39in to 54in diameter can be accommodated.

* * *

In the current issue (No. 27) of *Wiggin Nickel Alloys* is a short illustrated article on the production, on Omes machines, of Nimonic 80A blades for the Wright J65 gas turbine by the electrical upsetting process. In the same issue is an article on the Saunders-Roe 45 lb-thrust pulse-jet, in which Nimonic 75 is extensively used.

* * *

A brochure entitled *The Application of Light Alloys to Engineering*, published by Head Wrightson Aluminium, Ltd., of Teesdale Ironworks, Thornaby-on-Tees, has a novel, attractively embossed, front cover of 16-gauge aluminium sheet supplied by the British Aluminium Co., Ltd.

* * *

Recent appointments in Vickers-Armstrongs, Ltd., aircraft division include those of Mr. A. W. E. Houghton as assistant general manager (experimental), and of Mr. A. H. C. Greenwood, A.R.Ae.S., as assistant general manager (service). Mr. J. Anderson's appointment as commercial manager continues. At the Weybridge Works, Mr. R. Edmonds, M.B.E., becomes manager, works administration; Mr. T. C. Parker, M.B.E., works superintendent; Mr. L. R. Webb, works manager; Mr. P. D. Imlach, production manager; and Mr. J. E. Armitage, F.C.W.A., commercial manager. At the Supermarine Works, Mr. N. Sims is appointed commercial manager.

* * *

New directors have been appointed to the boards of Austinlite, Ltd., and Sumo Pumps, Ltd., the two English subsidiaries of Stone-Chance, Ltd., the new company incorporated on May 27th, 1954, and itself a subsidiary of J. Stone and Co. (Holdings), Ltd. The Austinlite directors are now Mr. John Raymond, Mr. F. W. G. Beaumont, Mr. L. B. H. Hallett and Mr. N. A. W. Stacey, and the directors of Sumo Pumps are Mr. John Raymond, Mr. T. O. Orr, Mr. F. W. G. Beaumont, Mr. L. B. H. Hallett and Mr. N. A. W. Stacey. All except Mr. John Raymond are new directors appointed from the management of the companies.

ANNOUNCING THE 1954 AIR RACE

for the

GOODYEAR TROPHY

The annual race for the Goodyear Trophy, presented by the Goodyear Tyre and Rubber Co. (G.B.) Ltd., will be held this year at

SHOREHAM AIRPORT on August 28th

FIRST PRIZE—Replica of the Trophy

GOODYEAR

AVIATION PRODUCTS

THE GOODYEAR TYRE & RUBBER COMPANY (G.B.) LIMITED, WOLVERHAMPTON & WALLASEY

ACRATORK

Some users of "ACRATORK" Equipment

Airwork Ltd.
Alvis Ltd.
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Boulton Paul Aircraft Ltd.
Bristol Aeroplane Co.
British European Airways
British Overseas Airways Corpn.
Burnley Aircraft Ltd.
De Havilland Engine Co. Ltd.
English Electric Co. Ltd.
Field Aircraft Services Ltd.
Girlings Ltd.
Sir G. Godfrey & Partners Ltd.
Handley Page (Reading) Ltd.
Hawker Aircraft Ltd.
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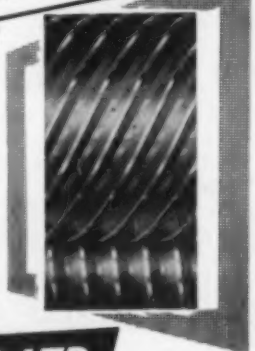

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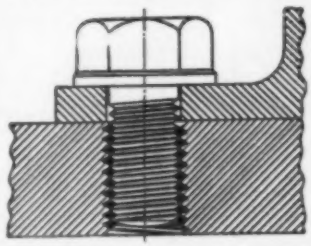

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THE Air Transport Advisory Council give notice that they have received the undermentioned application to operate a scheduled air service:—

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THIS application will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to this application must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, Westminster, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [2456

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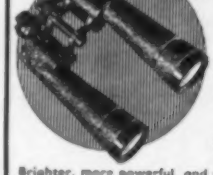

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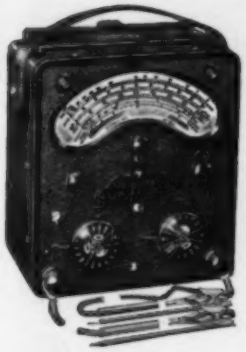

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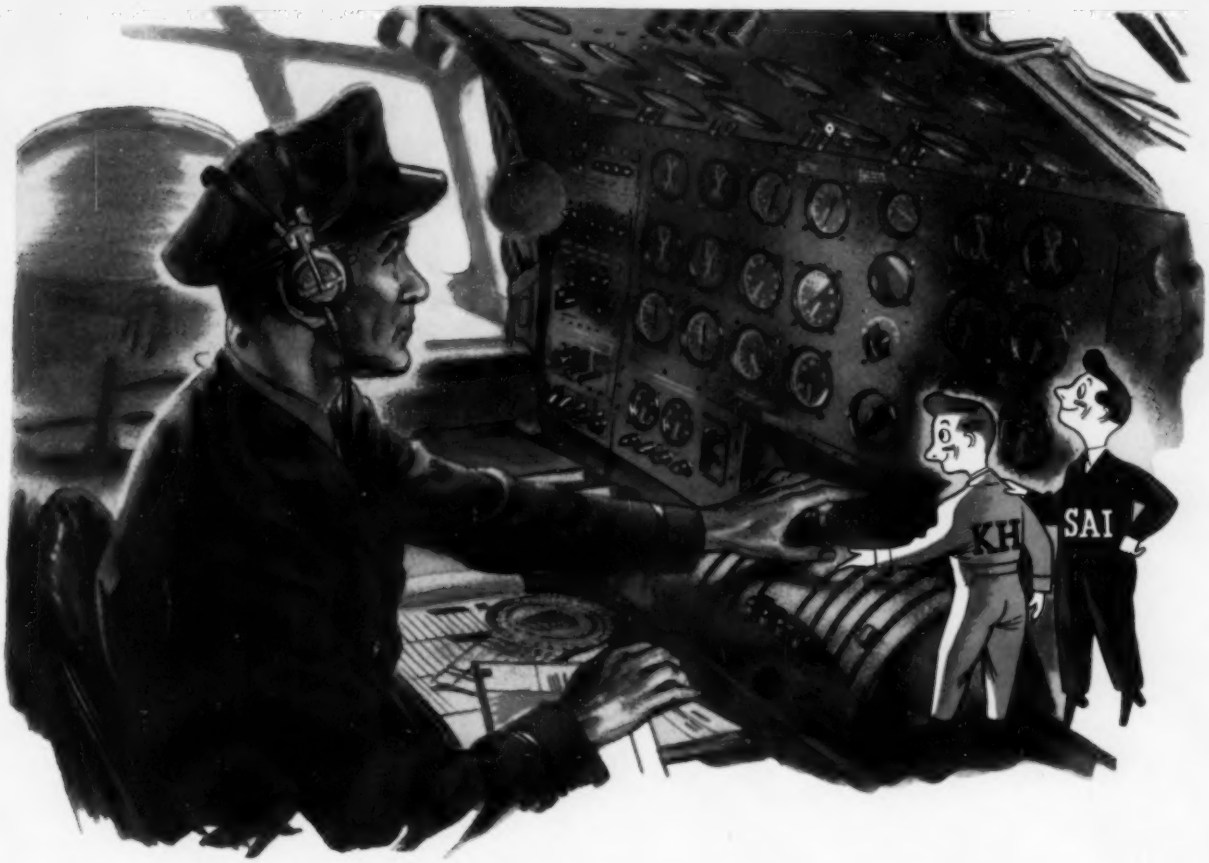

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